California Regional Water Quality Control Board
Santa Ana Region

Final
Problem Statement
for the
Total Maximum Daily Load
For Toxic Substances
In Newport Bay and San Diego Creek

December 15, 2000

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Section 1 Summary of the Problem Statement for the TMDL for Toxic Substances in Newport Bay and San Diego Creek

Pursuant to the requirements of Section 303(d) of the Clean Water Act (CWA), in the late 1980's and early 1990's, the Regional Board listed Newport Bay and San Diego Creek as impaired due, in part, to violations, or threatened violations of the Basin Plan narrative objectives for toxic substances (CRWQCB, Santa Ana Region, Section 303(d) List, 1998). These listings were based on evidence of the relatively high bioaccumulation of lead, DDT, PCB's and other toxic substances in mussel and fish tissue collected from the Bay and Creek. These data were provided by the State Water Resource Control Board's State Mussel Watch (SMW) and Toxic Substances Monitoring (TSM) Programs.

SMW and TSM are statewide programs designed to provide data on the spatial and temporal distribution of toxic substances in California's surface waters. The data are intended to be used to identify the need for additional focused monitoring in apparent problem areas. In general, the data are not statistically sufficient to support fish or shellfish consumption advisories to protect public health (Bob Brodberg, OEHHA, personal communication April 2000), or to make definitive conclusions regarding the impacts of toxic substances on aquatic or other biota in Newport Bay and San Diego Creek. Therefore, in placing Newport Bay and San Diego Creek on the Section 303(d) list, the Board did not specifically identify those toxic substances to be addressed by a TMDL.

The Regional Board and the State Water Resources Control Board completed additional studies to evaluate the nature and impact of toxic substance discharges on Newport Bay and San Diego Creek. This more recent evidence confirms the Regional Board's listing decision, and serves as the basis for refinement of the Section 303(d) list to identify those pollutants that are known (or suspected) to be causing violations of water quality standards, and that therefore must be addressed by a TMDL.

The Basin Plan specifies two narrative water quality objectives for toxic substances. These are that (1) toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health, and (2) the concentration of toxic substances in the water column, sediment or biota shall not adversely affect beneficial uses. Evidence of acute and chronic toxicity to aquatic organisms as the result of toxic substances in the water column and sediment indicates that the second objective is being violated in San Diego Creek and Upper and Lower Newport Bay. The bioaccumulation data provided by the SMW and TSM programs remains insufficient to judge whether a public threat is posed by the consumption of fish or shellfish collected from the Bay or San Diego Creek. However, the evidence does indicate that some toxic substances are bioaccumulating in fish and mussel tissue at levels that, if confirmed by statistically significant tissue monitoring, would pose a threat to human consumers. Thus, there is evidence that the first objective is being, or is threatened to be, violated. Further, the bioaccumulation data provided by the SMW and TSM programs indicate that the concentrations of certain toxic substances in fish and shellfish in San Diego Creek and Newport Bay may adversely affect the biota, which would constitute violations of the second objective.

The U.S. EPA recently promulgated numeric water quality objectives for 126 toxic substances for California's inland surface and bay and estuarine waters (California Toxics Rule, May 18, 2000). The CTR criteria automatically become a part of the Basin Plan water quality objectives. Water column monitoring data indicates violations of the CTR chronic water quality objectives for selenium in San Diego Creek, and the acute and chronic water quality objectives for copper in Newport Bay.

This report summarizes the data reviewed to evaluate violations and threatened violations of the Basin Plan narrative and numeric water quality objectives for toxic substances in Newport Bay and its tributaries and the results of that assessment. In summary, six categories of toxic substance related problems have been identified for San Diego Creek and Newport Bay:

1. Evidence of water column acute and chronic toxicity to aquatic life in San Diego Creek and Newport Bay, indicating a condition of violations of the second Basin Plan narrative objective for toxic substances. The extent of water column toxicity in Newport Bay is not well defined and varies with fresh water flow discharges. In San Diego Creek at Campus Drive, approximately 1.0 Acute Toxicity Units (TUa) have been measured during base flow conditions and up to 10 TUa during periods with rain runoff. A Toxicity Identification Evaluation (TIE) shows that the aquatic life toxicity in San Diego Creek is caused by diazinon and chlorpyrifos, and unknown toxic substances. Other pesticides, such as carbaryl and bifenthrin, may be causing, or contributing to, this unknown toxicity. There is also evidence of toxicity found in the tributaries to San Diego Creek. There is some evidence of water column toxicity due to chlorpyrifos in Upper Newport Bay, as well as toxicity due to unknown causes. Diazinon does not appear to be causing toxicity in Newport Bay.

2. Concentrations of dissolved selenium in San Diego Creek at Campus, and in tributaries to San Diego Creek, exceed the 4-day average chronic effects California Toxics Rule Water Quality Objective. Concentrations of dissolved selenium in Newport Bay do not exceed the CTR water quality objectives. Concentrations of dissolved copper in Newport Bay exceed both the acute and chronic effects CTR water quality objectives. Concentrations of dissolved cadmium, chromium, lead, nickel, silver, and

zinc in Newport Bay and San Diego Creek at Campus Drive do not exceed the CTR water quality objectives for these toxic substances, which indicates these chemicals are probably not causing, or contributing to, toxicity to aquatic life in Newport Bay and San Diego Creek. This is supported by limited TIE evidence. Concentrations of dissolved selenium in San Diego Creek, and dissolved copper in Newport Bay, may be causing, or contributing to, toxicity to aquatic life, indicating a threatened violation of the second Basin Plan narrative objective for toxic substances.

3. Evidence of acute and chronic toxicity to aquatic life in the sediment, and the porewater of the sediment, in Upper and Lower Newport Bay, indicating a violation of the second Basin Plan narrative objective for toxic substances. The cause of this toxicity is unknown, but a statistical correlation was found between sediment toxicity/sediment pore water toxicity to amphipods and sea urchin larvae, and percent fines, total organic carbon, antimony, chromium, copper, lead, mercury, nickel, tin, zinc, chlordane, and PCBs. There is also a correlation between degraded benthic organisms and chromium, copper, iron, nickel, DDE, and percent fnes. The toxicity to aquatic life in the sediment may also cause or contribute to the toxicity measured in the water column and the degradation of benthic organisms observed in some areas of the Bay, and therefore indicate violations of the second narrative objective for toxic substances.

4. Evidence of bioaccumulation of arsenic, chromium, lead, zinc, PCBs, and DDT in mussel tissue in the Rhine Channel area, at the west end of Lower Newport Bay. (The Regional Board has already identified the Rhine Channel as a Toxic Hot Spot for priority action.) Arsenic also appears to be bioaccumulating at the Pacific Coast Highway Bridge.

5. Evidence of continued, but declining, bioaccumulation of chemicals no longer in use, including DDT, chlordane, dieldrin, and PCBs, in mussel and clam tissue from samples collected in the Bay and lower San Diego Creek.

6. Questions about evidence for toxic substances found in various monitoring programs to be exceeding USEPA or other water, sediment, and tissue concentration regulatory and screening values. Data, and/or regulatory/screening values, for these substances are inadequate to determine whether and to what extent there is a violation of the narrative objectives for toxic substances or an impact to beneficial uses caused by the chemicals.

This problem statement, and the toxic substance water quality problems identified below, serve to refine the Section 303(d) list for Newport Bay and San

Diego Creek and will be used as the basis for the completion of the TMDLs for toxic substances in these two water bodies. The Regional Board will also be asked to approve the Problem Statement to specifically identify the toxic substances related water quality problems and the work plan for the development of the TMDL for the identified problems and toxic substances.

Section 2 The Newport Bay Watershed

The Newport Bay watershed is located in central Orange County, California (Figure 1). (OCPFRD, Flood Channel Map, 1998) The watershed encompasses 154 square miles and includes portions of the Cities of Newport Beach, Irvine, Laguna Hills, Lake Forest, Tustin, Orange, Santa Ana, and Costa Mesa. The watershed is encircled by mountains on three sides: the Santa Ana Mountains to the north, the Santiago Hills to the northeast, and the San Joaquin Hills to the south. The runoff from these mountains drains across the Tustin Plain and enters Newport Bay via Peters Canyon Wash and San Diego Creek. The San Diego Creek watershed, which encompasses Peters Canyon Wash, is 105 square miles in area. The other 49 square miles of drainage that enter Newport Bay include the Santa Ana-Delhi Channel, Bonita Creek, Big Canyon Wash, and a large number of smaller tributaries which drain to the Lower Newport Bay. Newport Bay is a long, enclosed estuary roughly divided into the Upper and Lower Bay areas by the Pacific Coast Highway Bridge. The entire Bay up to the mouth of San Diego Creek is subject to tidal influence.

The nature of the Newport Bay watershed has changed dramatically over the last 150 years, both in terms of land use and drainage patterns. In the late 19th and early 20th centuries, land use changed from ranching and grazing to farming. Following World War II, land use again began to change, from farming to residential and commercial development. In 1983, agriculture accounted for 22% and urban uses for 48% of the area of the Newport Bay watershed (OCPFRD, 1998). In 1993, agricultural uses accounted for 12% and urban uses for over 64% of the area. Table 1 summarizes the land use and area of the two largest subwatersheds, San Diego Creek and Santa Ana-Delhi. Agricultural activities in the watershed include row crops (primarily strawberries), avocados, lemons, and commercial nurseries. Urban development in the area consists of residential, commercial, and light industrial land uses.

Significant drainage modifications were made in the watershed to accommodate these changes in land use (Figure 2). (Trimble, 1987) In the mid-19th century, the Santa Ana River flowed into Newport Bay, while San Diego Creek and the small tributaries from the Santiago Hills drained into an ephemeral lake and the Swamp of the Frogs and then into the River. To make room for farming, the ephemeral lake and Swamp of the Frogs were drained and the vegetation was cleared. Channels that did not always follow natural drainage patterns were constructed to convey runoff to San Diego Creek and then Newport Bay. In the early 20th century, a major flood event on the Santa Ana River caused a significant amount of sediment to be deposited into the Lower Bay, and the local community dug a channel for the River to bypass the Bay and discharge directly to the Pacific Ocean. In 1920, the River was permanently diverted into the current flood control channel that discharges to the ocean. As urban development in the watershed proceeded (and proceeds), the drainages were further modified to expand their capacity in order to provide flood protection to the structures being built. These changes to the drainage patterns in the San Diego Creek Watershed culminated in the channelization of San Diego Creek in the early 1960s by the Orange County Flood Control Department. The channelization isolated the San Joaquin Marsh, the last remaining portions of the historic marsh upstream of Upper Newport Bay, from San Diego Creek.

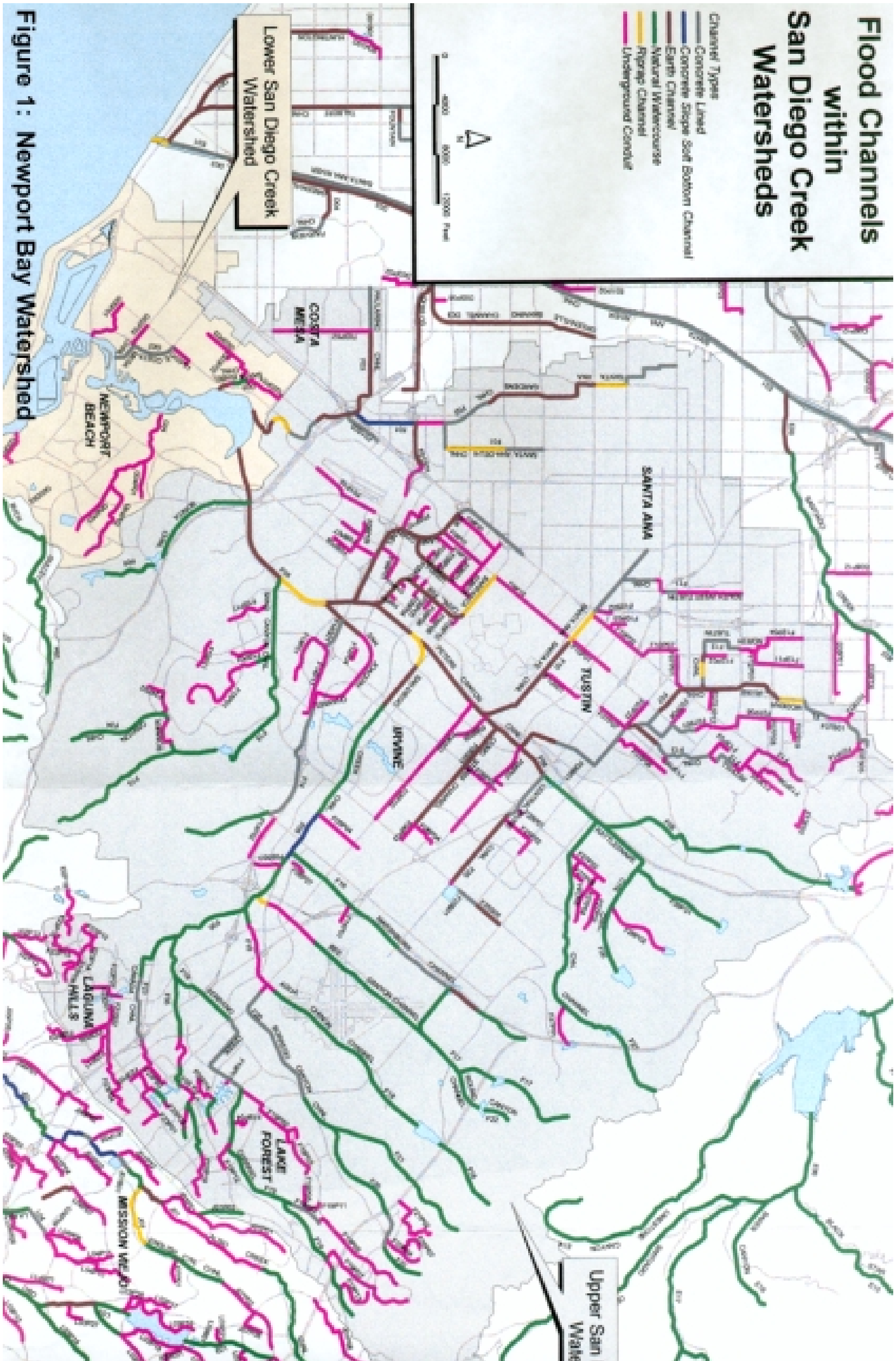

Figure 1: Newport Bay Watershed

Table 1: Summary of Land Use in the San Diego Creek and Santa Ana Delhi Watersheds (OCPFRD, 1998)

Land Use	San Diego Creek	San Diego Creek		Santa Ana Delhi	Santa Ana Delhi	
	Sq. Mi.	% of watershed		Sq. Mi.	% of watershed	
Residential	17.9	15		5.6	33	
Commercial	9.5	8		2.9	17	
Industrial	7.5	6.3		1.4	8	
Open Space	27.5	23.1		1	5.6	
Agricultural	11.9	10		0.3	1.5	
Public	0.4	0.3		0.2	1.2	
Recreation	0.4	0.3		0.2	1.3	
Transportation Utilities	1.4	1.2		0.5	3	
Roads	42.6	35.8		5.2	30.4	

These land use and drainage modifications have affected the nature and magnitude of toxic substance discharges to the Bay. Changing land use introduced new sources of toxic substances, while the drainage of historic marshes and wetlands reduced the toxic substances removal benefits such habitats can provide. The change of land use from grazing type agriculture to orchards and row crops has increased the amount of pesticide use in the watershed, resulting in discharges of pesticides from these areas. However, it is important to note that since the data from Table 1 was collected there has been a continual conversion of agricultural land to urban development, which has resulted in pesticide discharges in runoff from the structural and landscape control of pests. Currently, agricultural land in the watershed is less that 7,500 acres, which are approximately 7% of the land area, as compared to 12% in 1998. (Christina Smith, UCCE, Personal Communication, March, 2000)

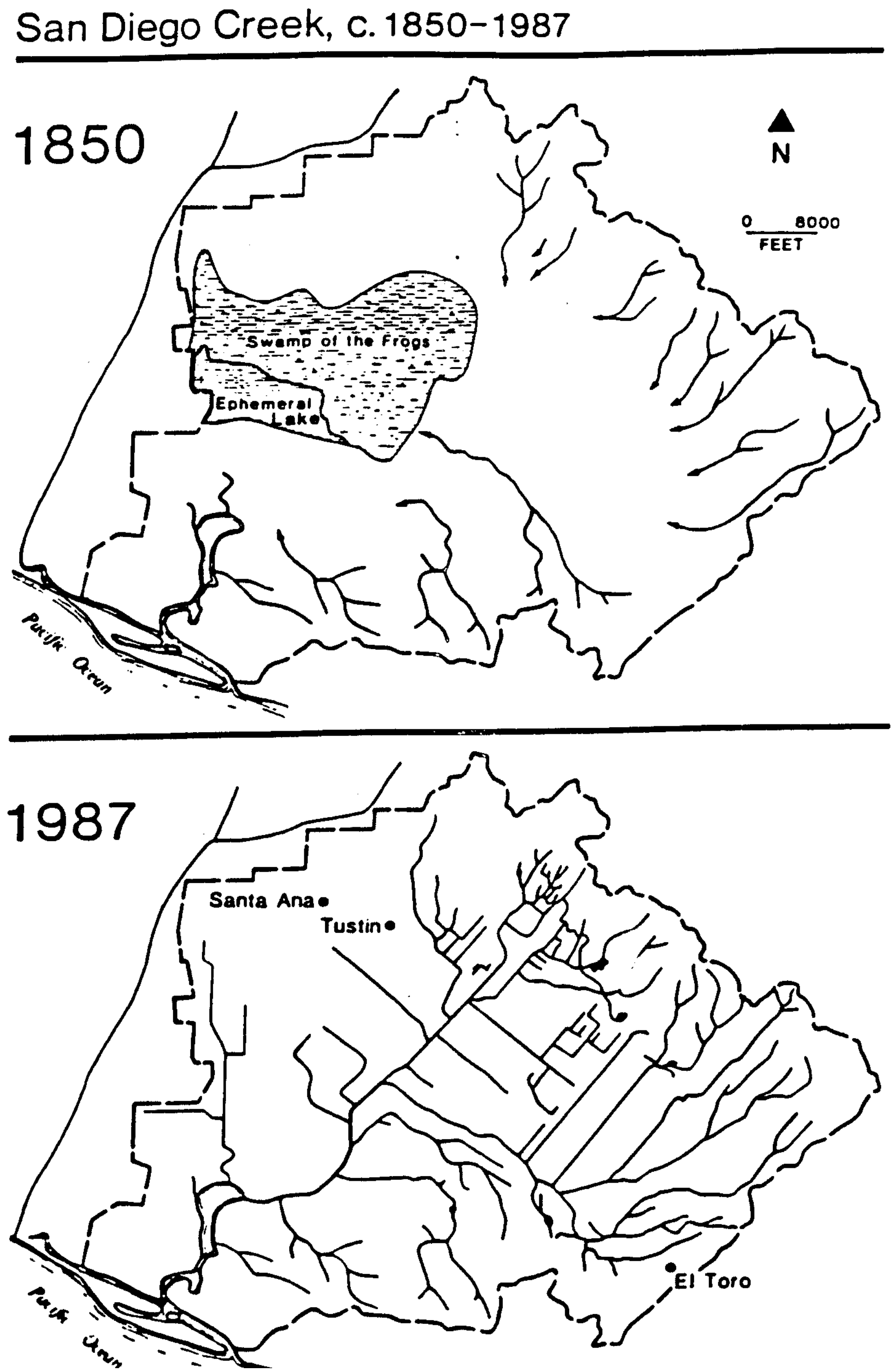

Figure 2: **Comparative Differences in Drainage Patterns over 137 Years in the Newport Bay/San Diego Creek Watershed (Trimble, 1987)**

Major portions of San Diego Creek and the other tributaries are basically flood control channels with flows consisting largely of urban runoff. During the dry season, the flow volumes in San Diego Creek are generally low, 7 to 10 cubic feet per second, comprised of urban runoff and surfacing groundwater, and are insufficient for most swimming. Water contact recreation would be limited to wading and swimming by children. During rain events, when the flow volumes increase, the flow velocity makes it unsafe for swimming. The Orange County Flood Control District has restricted public access to many of the drainages to Newport Bay because of the unsafe conditions during storm events. Due to channelization and bank stabilization, major portions of San Diego Creek and its tributaries contain only limited and intermittent aquatic life resources. Upstream of the 405 freeway the Creek and the tributaries have very little riparian vegetation and aquatic resources are limited to minnows and small fish that are not fished for human consumption. Downstream of the 405 freeway the San Diego Creek channel was constructed in the late 1960's and includes sufficient volume for flood control and to maintain a strip of riparian vegetation. This reach of the Creek also contains three sediment control basins that provide pond areas for carp and other fish. This lower reach therefore has more valuable aquatic resources.

The watershed has a Mediterranean type climate characterized by short, mild wet winters and hot dry summers. There are two types of rainstorms in this region: most are related to the extra tropical cyclones of winter, and the others are infrequent summer thunderstorms. Both types of storms produce intense rainfall. According to the Orange County Environmental Management Agency, the 40-year average annual rainfall recorded at Tustin-Irvine Ranch Station was calculated to be 12.67 inches, of which 90% occurs between November and April.

Section 2.1 Beneficial Uses and Water Quality Objectives

The 1995 Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) establishes water quality standards for Newport Bay and San Diego Creek. (CRWQCB, Santa Ana Region, Basin Plan, 1995) These water quality standards include the designated beneficial uses of these water bodies and the water quality objectives for the protection of these beneficial uses. The beneficial uses of San Diego Creek and Newport Bay as identified in the (Basin Plan) are listed in Table 2.

The Basin Plan also contains two applicable narrative water quality objectives for enclosed bays and estuaries and inland surface waters that relate to toxic substances impairment in Newport Bay and San Diego Creek:

> Toxic Substances
>
> Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels, which are harmful to human health.

and

> The concentration of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

US EPA promulgated numeric water quality criteria for priority toxic substances for enclosed bays and estuaries and inland surface waters of the State of California, including Newport Bay and San Diego Creek, on May 18, 2000 (California Toxics Rule (CTR), Federal Register, May 18, 2000). These criteria are now numeric water quality objectives in the Basin Plan. The State Water Resources Control Board adopted an implementation plan for these promulgated objectives on March 2, 2000. (SWRCB, Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays and Estuaries of California, March 2, 2000) The CTR numeric water quality objectives are shown in Table 3 below. The list includes objectives for the protection of aquatic life in the form of a Constituent Maximum Concentration (CMC) and a Constituent Chronic Concentration (CCC). These are instantaneous maximum and 4 day average concentrations for the protection of aquatic life from acute and chronic effects, respectively. Also listed are the water quality objectives for the protection of human health from the consumption of fish and organisms.

Table 2. Beneficial Uses of San Diego Creek, Tributaries, and Newport Bay

	GWR	NAV	REC1	REC2	COMM	WARM	BIOL	WILD	RARE	SPWN	MAR	SHEL	EST
San Diego Creek, Reach 1[b]			X	X		X		X					
San Diego Creek, Reach 2	|		|	|		|		|					
Tributaries to San Diego Creek [C]	|		|	|		|		|					
Upper Newport Bay			X	X	X		X	X	X	X	X	X	X
Lower Newport Bay		X	X	X	X			X	X	X	X	X	

[a] X denotes a present or potential beneficial use, | denotes an intermittent beneficial use.
[b] Reach 1 is from Jeffrey Road to Newport Bay, Reach 2 is from Jeffrey Road to the headwaters.
[C] Sand Canyon has a **RARE** beneficial use.

Beneficial Uses:

Groundwater Recharge (**GWR**)
Navigation (**NAV**)
Water Contact Recreation (**REC1**)
Non-contact Water Recreation (**REC2**)
Commercial and Sportfishing (**COMM**)
Preservation of Biological Habitats of Special Significance (**BIOL**)
Spawning, Reproduction, and Development (**SPWN**)
Wildlife Habitat (**WILD**)
Estuarine Habitat (**EST**)
Shellfish Harvesting (**SHEL**)
Marine Habitat (**MAR**)
Warm Freshwater Habitat (**WARM**)
Rare, Threatened or Endangered Species (**RARE**)

Table 3: California Toxic Rule Water Quality Objectives for Toxic Substances

	Compound	Fresh Water		Consumption of	Salt Water	
		CMC	**CCC**	**Organisms**	**CMC**	**CCC**
		ppb	**ppb**	**ppb**	**Ppb**	**ppb**
1	Antimony			4300		
2	Arsenic	340	150		69	36
3	Beryllium	Narrative Objectives for Toxic Substances				
4	Cadmium	21.6	7.31		42	9.3
5a	Chromium III	5405	644.2			
5b	Chromium VI	16	11		1100	50
6	Copper	51.7	30.5		4.8	3.1
7	Lead	477	39.22		210	8.5
8	Mercury	1.4	0.77	0.051	1.8	0.94
9	Nickel	1516	168.54	4600	74	8.2
10	Selenium		5		290	71
11	Silver	44.1			1.9	
12	Thallium			6.3		
13	Zinc	388	387.83		90	81
14	Cyanide	22	5.2	220,000	1	1
15	Asbestos					
16	2,3,7,8 TCDD			0.000000014		
17	Acrolein			780		
18	Acrylonitrile			0.66		
19	Benzene			71		
20	Bromoform			360		
21	Carbon Tetrachloride			4.4		
22	Chlorobenzene			21,000		
23	Chlorodibromomethane			34		
24	Chlorethane					
25	2-Chrlorethylvinyl Ether					
26	Chloroform			470		
27	Dichlorobromomethane			46		
28	1,1-Dichloroethane					
29	1,2-Dichloroethane			99		
30	1,1-Dichloroethylene			3.2		
31	1,2-Dichloropropane			39		
32	1,3-Dichloropropylene			1700		

Table 3: California Toxic Rule Water Quality Criteria for Toxic Substances

	Compound	Fresh Water		Consumption of	Salt Water	
		CMC	CCC	Organisms	CMC	CCC
		Ppb	ppb	ppb	ppb	ppb
33	Ethylbenzene			29,000		
34	Methyl Bromide			4,000		
35	Methyl Chloride	Narrative Objectives for Toxic Substances				
36	Methylene Chloride			1,600		
37	1,1,2,2-Tetrachloroethane			11		
38	Tetrachloroethylene			8.85		
39	Toluene			200,000		
40	1,2-Trans-Dichloroethylene			140,000		
41	1,1,1-Trichloroethane	Narrative Objectives for Toxic Substances				
42	1,1,2-Trichloroethane			42		
43	Trichloroethylene			81		
44	Vinyl Chloride			525		
45	2-Chlrophenol			400		
46	2,4-Dichlorophenol			790		
47	2,4-Dimethylphenol			2300		
48	2-Methyl-4,6-Dinitrophenol			765		
49	2,4-Dinitrophenol			14,000		
50	2-Nitrophenol					
51	4-Nitrophenol					
52	3-Methyl-4-Chlorophenol					
53	Pentachlorophenol	19	15	8.2	13	7.9
54	Phenol			4,600,000		
55	2,4,6-Trichlorophenol			6.5		
56	Acenaphthene			2,700		
57	Acenaphthylene					
58	Anthracene			110,000		
59	Benzidine			0.00054		
60	Benzo(a)Anthracene			0.049		
61	Benzo(a)Pyrene			0.049		
62	Benzo(b)Fluoranthene			0.049		
63	Benzo(ghi)Perylene					
64	Benzo(k)Fluoranthene			0.049		
65	Bis(2-Chloroethoxy)Methane					
66	Bis(2-Chloroethyl)Ether			1.4		
67	Bis(2-Chloroisopropyl)Ether			170,000		
68	Bis(2-Ethylhexyl)Phthalate			5.9		

Table 3: California Toxic Rule Water Quality Criteria for Toxic Substances

	Compound	Fresh Water		Consumption of	Salt Water	
		CMC	CCC	Organisms	CMC	CCC
		Ppb	ppb	ppb	ppb	ppb
69	4-Bromophenyl Phenyl Ether					
70	Butylbenzyl Phthalate			5200		
71	2-Chloronaphthalene			4,300		
72	4-Chlorophenyl Phenyl Ether					
73	Chrysene			0.049		
74	Bibenzo(a,h)Anthracene					0.049
75	1,2 Dichlorobenzene			17,000		
76	1,3 Dichlorobenzene			2,600		
77	1,4 Dichlorobenzene			2,600		
78	3,3 Dichlorobenzidine			0.077		
79	Diethyl Phthalate			120,000		
80	Dimethyl Phthalate			2,900,000		
81	Di-n-Butyl Phthalate			12,000		
82	2,4-Dinitrotoluene			9.1		
83	2,6-Dinitrotoluene					
84	Di-n-Octyl Phthalate					
85	1,2-Diphenylhydrazine			0.54		
86	Fluoranthene			370		
87	Fluorene			14,000		
88	Hexachlorobenzene			0.00077		
89	Hexachlorobutadiene			50		
90	Hexachlorocyclopentadiene					17,000
91	Hexachloroethane			8.9		
92	Indeno(1,2,,3-cd)Pyrene					0.049
93	Isophorone			600		
94	Naphthalene					
95	Nitrobenzene			1,900		
96	N-Nitrosodimethylamine				8.1	
97	N-Nitrosodi-n-Propylamine					1.4
98	N-Nitrosodiphenylamine				16	
99	Phenanthrene					
100	Pyrene			11,000		
101	1,2,4-Trichlorobenzene					
102	Aldrin			0.00014		
103	alpha-BHC			0.013		
104	beta-BHC			0.046		
105	gamma-BHC			0.063		

Table 3:	California Toxic Rule Water Quality Criteria for Toxic Substances					
	Compound	**Fresh Water**		**Consumption of**	**Salt Water**	
		CMC	**CCC**	**Organisms**	**CMC**	**CCC**
		Ppb	**ppb**	**ppb**	**ppb**	**ppb**
106	delta-BHC					
107	Chlordane	2.4	0.0043	0.00059	0.09	0.004
108	4,4'-DDT	1.1	0.001	0.00059	0.13	0.001
109	4,4'-DDE			0.00059		
110	4,4'-DDD			0.00059		
111	Dieldrin	0.24	0.056	0.00014	0.71	0.002
112	alpha-Endosulfan	0.22	0.056	240	0.03	0.009
113	beta-Endosulfan	0.22	0.056	240	0.03	0.009
114	Endosulfan Sulfate			240		
115	Endrin	0.09	0.036	0.81	0.04	0.002
116	Endrin Aldehyde			0.81		
117	Heptachlor	0.52	0.0038	0.00021	0.05	0.004
118	Heptachlor Epoxide	0.52	0.0038	0.00011	0.05	0.004
119-125	PCBs		0.014	0.00017		
126	Toxaphene	0.73	0.0002	0.00075	0.21	0.0002

(A copy of this table from the CTR, with all applicable footnotes, is included in Appendix 1. A hardness of 400 mg/L was used to calculate the hardness dependent metal criteria in the above table. No objectives were promulgated where blank spaces are shown.)

Section 3.0 Regulatory and Screening Values Used in the Assessment of Violations of Water Quality Standards for Toxic Substances in Newport Bay and San Diego Creek

To identify and rank toxic substance water quality problems in Newport Bay and San Diego Creek, and evaluate compliance with the Basin Plan objectives for toxic substances, monitoring data of various types (described in detail in Section 4) were compared to relevant regulatory values, (including the Basin Plan objectives and CTR objectives cited above), and screening values for sediment, and fish tissue consumption. The assessment included:

1. Comparison of fish, mussel, and clam tissue monitoring data from the State Mussel Watch program and Toxics Substances Monitoring program to the Food and Drug Administration regulatory values (action levels), the National Academy of Science fish tissue screening values (Guidelines), the Median of International Standards for heavy metals screening values, Maximum Tissue Residue Levels screening values, USEPA risk based

consumption screening values, and California Office of Environmental Health Hazard Assessment (OEHHA) fish advisory screening values.

2. Comparison of 1) toxicity, 2) sediment chemistry, and 3) benthic organism abundance and diversity data from the Bay Protection and Toxic Cleanup Program, to 1) toxicity control tests, 2) National Oceanic and Atmospheric Administration (NOAA) sediment screening values, and 3) benthic abundance and diversity data from Newport Bay reference stations and other estuaries in Southern California.

3. Comparison of water column monitoring data from Irvine Ranch Water District to the CTR water quality objectives.

4. Comparison of water column and sediment chemistry monitoring data from the County of Orange Public Facilities and Resources Department to the CTR water quality objectives and NOAA sediment screening values, respectively.

5. Comparison of toxicity testing data, water column chemistry, and toxicity identification evaluation data from the County of Orange Public Facilities and Resources Department to toxicity results from analyses of other waste discharges and California Department of Fish Game Acute and Chronic screening values for diazinon and chlorpyrifos.

6. Comparison of toxicity testing and water column pesticide monitoring data from the Department of Pesticide Regulation to toxicity results from analyses of other waste discharges and California Department of Fish Game Acute and Chronic screening values for diazinon and chlorpyrifos.

7. Comparison of surface and ground water selenium concentrations measured by Cal State Los Angeles, and others, to CTR water quality objectives for selenium.

It is important to distinguish the legal status of the regulatory and screening values used in this assessment. Regulatory values are formally adopted, and serve as the basis for legally enforceable regulatory actions. These regulatory values include the Basin Plan water quality objectives adopted by the Regional Board, and the water quality objectives promulgated for California by the U.S. EPA, as outlined in Section 2.1, above. Among other things, these objectives serve as the basis for setting effluent limitations for waste discharges. Violation of these objectives can also trigger federal TMDL requirements and the need for corrective actions. FDA action levels are another type of legally enforceable regulatory value that, if exceeded, necessitate the removal of shellfish and fish from the marketplace.

Screening values have not been formally adopted for regulatory purposes. These include the USEPA and State Department of Fish and Game water quality criteria for diazinon and chlorpyrifos, the fish contamination screening values used by the SWRCB, USEPA, and OEHHA, the NOAA sediment screening values, and the National Academy of Science Guiedelines. These screening values are based on the latest scientific research and peer reviewed. They are usually developed using available USEPA protocols for developing water quality, sediment, and biological criteria. Use of these comparative screening values provide a scientifically defensible approach to determining compliance with the narrative objectives for toxic substances contained in the Basin Plan when adopted numeric objectives for a pollutant are not available. For example, the OEHHA fish contamination screening values are based on similar USEPA draft screening values, which are developed using a risk based approach that estimates human health risk based on the concentration of a pollutant in fish tissue, the amount of fish tissue consumed (usually per month), and the body weight of the individual consuming the contaminated fish tissue. OEHHA uses these risk based screening values as guidance in determining whether fish or shellfish consumption advisories are appropriate to protect public health. Some of the comparative screening values used here (e.g., Maximum Tissue Residue Levels and Median International Standards) are statistically derived and are intended as data assessment tools to indicate water bodies with potential human health and aquatic life concerns.

The following sections describe in more detail the relevant comparative regulatory and screening values used in this assessment.

Section 3.1 Food and Drug Administration Action Levels; National Academy of Science Guidelines

The Food and Drug Administration (FDA) and the National Academy of Sciences (NAS) have developed Action Levels and Guidelines, respectively, for a limited number of toxic substances in freshwater and marine organisms. The FDA regulatory Action Levels and the NAS screening values for shellfish are shown in Table 4. (SWRCB, SMW 1993-95 Data Report, November 1996) Those for fish are shown in Table 5. (SWRCB, TSMP 1994-95 Data Report, October 1997)

The FDA Action Levels are intended to protect humans from the chronic effects of toxic substances consumed in foodstuffs. They are based on the assumptions that (1) there is a 1 in 100,000 risk of cancer from consuming fish/shellfish tissue contaminated at or above the specified levels; and (2) an average of less than 2 ounces of contaminated tissue is consumed each month. (This type of risk-based approach to evaluating the level of risk to human health posed by contaminated fish tissue is discussed in greater detail in the section below that describes the draft USEPA guidance document on the development of risk-based screening values. Risk-based screening values are also used by OEHHA for DDT, PCB's, chlordane, and other toxic substances as discussed below.)

The NAS Guidelines, which are screening values, were established to protect both the organisms containing the toxic substances and the species that consume those organisms. Reflecting this difference, the NAS screening values for fish are based on whole fish, which predators would consume, while the FDA regulatory action levels are based on fish filets, the portion typically eaten by humans.

Table 4: NAS Guidelines (Screening Values) and FDA Action Levels (Regulatory Values) for Toxic Chemicals in Shellfish (wet weight)

Chemical	NAS[a] Recommended Guideline for Freshwater Shellfish		FDA[b] Action Levels for Freshwater and Marine Shellfish	
	ug/g (ppm)	ng/g (ppb)	ug/g (ppm)	ng/g (ppb)
Mercury	-	-	1.0[c]	1,000
DDT (total)	1.0	1,000	-	-
PCB (total)	0.5	500	2.0[d]	2,000
Aldrin	-	-	0.3	300
Dieldrin			0.3	300
Endrin			0.3	300
Heptachlor			0.3	300
Heptachlor Epoxide			0.3	300

a. National Academy of Science-National Academy of Engineering. 1973. Water Quality Criteria, 1972 (Blue Book). USEPA, Ecological Research Series

b. U.S. Food and Drug Administration. 1984. Shellfish Sanitation Interpretation: Action Levels for Chemicals and Poisonous Substances, June 21, 1984. USFDA, Shellfish Sanitation Branch, Washington D.C.

c. As methyl mercury

d. A tolerance, rather than an action level, has been established for PCBs (21CFR 109, May 29, 1984). An action level is revoked when a regulation establishes a tolerance for the same substance and use.

Table 5: NAS Guidelines (Screening Values) and FDA Regulatory Action Levels (Regulatory Values) for Toxic Chemicals in Fish (wet weight)

Chemical	NAS[a] Recommended Guideline for Freshwater Fish (Whole Fish)		FDA[b] Action Levels for Freshwater and Marine Fish (Edible Portion)	
	ug/g (ppm)	ng/g (ppb)	ug/g (ppm)	ng/g (ppb)
Mercury	0.5	500	1.0[d]	1,000
DDT (total)	1.0	1,000	5.0	5,000
PCB (total)	0.5	500	2.0[e]	2,000
Aldrin	0.1[c]	100	0.3	300
Dieldrin	0.1[c]	100	0.3	300
Endrin	0.1[c]	100	0.3	300
Heptachlor	0.1[c]	100	0.3	300
Heptachlor Epoxide	0.1[c]	100	0.3	300
Chlordane	0.1[c]	100	0.3	300
Lindane	0.1[c]	100		
HCH	0.1[c]	100		
Endosulfan	0.1[c]	100		
Toxaphene	0.1[c]	100	5	5000

a. National Academy of Science-National Academy of Engineering. 1973. Water Quality Criteria, 1972 (Blue Book). USEPA, Ecological Research Series

b. U.S. Food and Drug Administration. 1984. Shellfish Sanitation Interpretation: Action Levels for Chemicals and Poisonous Substances, June 21, 1984. USFDA, Shellfish Sanitation Branch, Washington D.C.

c. Individually or in combination. Chemicals in this group under NAS Guidelines are referred to as Chemical Group A in this report.

d. As methyl mercury

e. A tolerance, rather than an action level, has been established for PCBs (21CFR 109, May 29, 1984). An action level is revoked when a regulation establishes a tolerance for the same substance and use.

Section 3.2 Maximum Tissue Residue Levels (MTRLs) Screening Values

The SWRCB staff has developed Maximum Tissue Residue Levels (MTRLs), shown in Tables 6 and 7, to evaluate whether toxic substances are bioaccumulating in fish or shellfish tissue to levels at which there may be a threat to public health. (SWRCB, SMW 1993-95 Data Report, November 1996 and SWRCB, TSMP 1994-95 Data Report, October 1997) The MTRL is the USEPA CTR water quality objective for each of the chemicals listed, multiplied by a bioconcentration factor (BCF) that was also developed by the USEPA during the development of the water quality objective. The bioconcentration factor is an estimate of the average amount of bioconcentration found by the USEPA. This is a rough estimate of a chemical's propensity to bioaccumulate that is used to evaluate whether a chemical, that is not detected in normal water column monitoring, may be bioaccumulating in aquatic resources to levels that may pose a threat to beneficial uses of the waters of the State or public health. MTRLs are used as alert levels or guidelines in water quality assessments and are not compliance or enforcement criteria.

Table 6: Maximum Tissue Residue Levels (MTRLs) (Screening Values) In Enclosed Bays and Estuaries

Carcinogens			
Substance	**Water Quality Objective[a] (ug/L)**	**BCF[b] (l/kg)**	**MTRL[c] (ug/kg, ppb)**
Aldrin	0.00014	D	0.33
Chlordane	0.000081	14,100	1.2
DDT (total)	0.0006	53,600	32
Dieldrin	0.00014	4,670	0.7
Heptachlor	0.00017	11,200	1.9
Heptachlor Epoxide	0.00007	11,200	0.8
Hexachlorobenzene (HCB)	0.00069	8,690	6.0
Hexachlorocyclohexane-alpha	0.0013	130	1.7
Hexachlorocyclohexane-beta	0.046	130	6.0
Hexachlorocyclohexane-gama	0.062	130	8.1
PAHs (total)	0.031	30	0.93
PCBs (total)	0.00007	31,200	2.2
Pentachlorophenol (PCP)	8.2	11	90
Toxaphene	0.00069	13,100	9.0
Non-carcinogens			
Endosulfan (total)	2.0	270	500
Endrin	0.8	3,970	3,200
Mercury	0.025	E	1,000
Nickel	4,600	47	220,000

a. From Draft Functional Equivalent Document-Development of Water Quality Plans for: Inland Surface Waters of California and Enclosed Bays and Estuaries of California (SWRCB, 1990b, the Draft April 9, 1991 Supplement to the Function Equivalent Document (SWRCB, 1991).

b. Bioconcentration factors taken from the USEPA 1980 Ambient Water Quality Criteria Documents for each substance.

c. MTRLs were calculated by multiplying the Water Quality Criteria by the BCF, except for aldrin and mercury.

d. Aldrin MTRL is derived from a combination of aldrin and dieldrin risk factors and BCFs as recommended in the USEPA 1980 Ambient Water Quality Criteria for Aldrin/Dieldrin, (USEPA, 1980)

e. The MTRL for mercury is the FDA action level. The water quality objective for mercury in the Enclosed Bays and Estuaries Plan is based on the FDA action level as recommended in the USEPA 1985 Water Quality Criteria for Mercury, (USEPA), 1985)

Table 7: Maximum Tissue Residue Levels (MTRLs) (Screening Values) In Inland Surface Waters

Substance	Water Quality Objective[a] (ug/L)	BCF[b] (l/kg)	MTRL[c] (ug/kg, ppb)
Carcinogens			
Aldrin	0.00013	D	0.05
Arsenic	5.0[e]	44	200
Chlordane	0.00008	14100	1.1
DDT (total)	0.00059	53600	32
Dieldrin	0.00014	4670	0.65
Heptachlor	0.00016	11200	1.8
Heptachlor Epoxide	0.00007	11200	0.8
Hexachlorobenzene (HCB)	0.00066	8690	6.0
Hexachlorocyclohexane-alpha	0.0039	130	0.5
Hexachlorocyclohexane-beta	0.014	130	1.8
Hexachlorocyclohexane-gama	0.019	130	2.5
PAHs (total)	0.0028	30	0.08
PCBs (total)	0.00007	31200	2.2
Pentachlorophenol (PCP)	0.28	11	3.1
Toxaphene	0.00067	13100	8.8
Non-carcinogens			
Cadmium	0.01	64	640
Endosulfan (total)	0.0009	270	250
Endrin	0.0008	3970	3000
Mercury	0.000012	F	1000
Nickel	0.6	47	28000

a. From Draft Functional Equivalent Document-Development of Water Quality Plans for: Inland Surface Waters of California and Enclosed Bays and Estuaries of California (SWRCB, 1990b, the Draft April 9, 1991 Supplement to the Function Equivalent Document (SWRCB, 1991).

b. Bioconcentration factors taken from the USEPA 1980 Ambient Water documents for each substance.

c. MTRLs were calculated by multiplying the Water Quality Criteria by the BCF, except for aldrin and mercury.

d. Aldrin MTRL is derived from a combination of aldrin and dieldrin risk factors and BCFs as recommended in the USEPA 1980 Ambient Water Quality Criteria for Aldrin/Dieldrin, (USEPA, 1980)

e. Arsenic MTRL was calculated from the formula NSRL/(WI/BCF) + FC = MTRL. [NSRL (California's No significant Risk Level for arsenic) = 10 ug/d, WI (Water Intake) = 2 liters/day, FC (daily fish consumption) = 0.0065 kg/d].

f. The MTRL for mercury is the FDA action level. The water quality objective for mercury in the Enclosed Bays and Estuaries Plan is based on the FDA action level as recommended in the USEPA 1985 Water Quality Criteria for Mercury, (USEPA), 1985)

Section 3.3 Median International Standards (MIS) Screening Values

The Food and Agriculture Organization of the United Nations published a survey of human health protection criteria used by member nations. (Table 8) (SWRCB, SMW 1993-95 Data Report, November 1996, SWRCB, TSMP 1994-95 Data Report, October 1997 and Nauen, 1983) The MIS is the median of the various criteria. These screening values vary somewhat in the tissues to be analyzed and the level of health risk accepted. The MIS do not apply within the United States, but provide a screening tool for assessing bioaccumulation monitoring data.

Table 8: Median International Standards For Trace Elements Screening Values (ppm, wet weight)[a]

Element	Freshwater Fish	Marine Shellfish	Range	Number of Countries w/ Standards
Arsenic	1.5	1.4	0.1-5.0	11
Cadmium	0.3	1.0	0.05-2.0	10
Chromium	1.0	1.0	1.0	1
Copper	20	20	10-100	8
Lead	2	2	0.5-10	19
Mercury	0.5	0.5	0.1-1.0	28
Selenium	2.0	0.3	0.3-2.0	3
Zinc	45	70	40-100	6

a. Based on: Nauen, C. C., Compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products, Food and Agriculture Organization of the United Nations, 1983.

Section 3.4 Office of Environmental Health Hazard Assessment Screening Values

The California Office of Environmental Health Hazard Assessment (OEHHA) is responsible for issuing fish consumption advisories in the State. OEHHA implements a statewide monitoring program of marine waters to evaluate the risk to public health from sportfishing off the coast.

Table 9 below lists the screening values OEHHA uses to screen fish tissue monitoring data to determine if they should collect more tissue data and/or issue fish consumption advisories regarding the number of recommended meals per month. (OEHHA, Contaminants in Sport Fish from Two California Lakes, June, 1999) When these screening values are exceeded OEHHA implements a monitoring program that is a statistically rigorous program that collects 10-20 fish from each station and composites filets from five fish into two to four different samples, which are then analyzed for toxic substances. If the average concentration of the chemicals from the samples exceeds the screening values, OEHHA may issue a consumption advisory. OEHHA also chooses which fish to sample based on sport fishing data so that those species that are consumed by the majority of the people are tested as part of their testing program. Table 9 also lists comparable screening values used by the USEPA. The only difference between the USEPA and OEHHA screening values are the meal size used in the calculation of the screening values.

There are no published OEHHA monitoring data now available for Newport Bay. However, OEHHA and the Department of Fish and Game have collected 5 Diamond Turbot, 15 Shiner Surfperch, 5 Black Surfperch, and 15 Speckled Sandabs, from Newport Bay over the past two years. Filets from these fish are currently being analyzed by the Department of Fish and Game Marine Lab at Moss Landing. Raw data from this monitoring are discussed below. These data help in the evaluation of all the bioaccumulation data to determine compliance with the Basin Plan narrative objective. The data will also assist the Southern California Coastal Water Research Project (SCCWRP), which has started an investigation of fish tissue concentrations in recreational sport fish caught from Newport Bay. (SCCWRP, Steve Bay, July, 2000) This investigation includes surveys of fish being caught from the Bay, amounts of fish consumed, and tissue concentrations from representative species of fish caught from the Bay. The intent of this study is to provide a more thorough characterization of fish tissue contamination in fish from Newport Bay, using a statistically rigorous sampling plan. The initial results of this two year study will be available by the time the Regional Board is asked to adopt a TMDL for toxic substances in Newport Bay.

Table 9: OEHHA and USEPA Fish Tissue Contamination Screening Values (SV) (OEHHA, June, 1999 Clean Lakes Study (CLS))

Chemical	USEPA[1]	OEHHA[2]
	ppb	ppb
Chlordane	80	30
Chlorpyrifos	30,000	10,000
Total DDT	300	100
Diazinon	900	300
Disulfoton	500	100
Dieldrin	7	2
Total endosulfan	60,000	20,000
Endrin	3000	1000
Ethion	5000	2000
Heptachlorepoxide	10	4
Hexachlorobenzene	70	20
HCH-Lindane	80	30
Toxaphene	100	30
PCBs	10	20
Dioxin TEQ	0.7 ppt	0.3 ppt
Arsenic	3000	1000
Cadmium	10,000	3000
Mercury	600	300
Selenium	50,000	20,000

1. USEPA SVs (USEPA, 1995) for carcinogens were calculated for a 70 kg adult using a cancer risk of 1 x 10-5. SVs for non-cancer effects were calculated for a 70 kg adult and exposure at the RfD (hazard quotient of 1). A fish consumption value of 6.5 g/day was used in both cases.

2. California SVs (CLS-SVs) specifically for the study were calculated according to USEPA guidance (USEPA, 1995). CLS-SVs for carcinogens were calculated for a 70 kg adult using a cancer risk of 1 x 10-5. CLS-LVs for non-cancer effects were calculated for a 70 kg adult and exposure at the RfD (hazard quotient of 1). A fish consumption value of 21 g/day was used in both cases.

The screening values used by OEHHA are risk based like the FDA regulatory action levels discussed above, and are based on a specific cancer risk (1 x 10-5), and other health risks, and consumption levels per month of contaminated fish tissue (21 grams/day). It should also be noted that, with the exception of the screening values for endrin and endosulfan, the OEHHA screening values for the protection of public health are lower than the NAS Guideline screening values

(Tables 4 and 5) which are supposed to also be protective of other natural predators of fish and shellfish.

Section 3.5 USEPA Draft Risk Based Consumption Screening Values

The USEPA has developed a draft guidance document (entitled "Draft Development of Risk Based Consumption Criteria", USEPA, May 2000) that outlines a risk based approach to the development of fish and shellfish tissue concentration criteria. This approach acknowledges that health risk varies with the amount of contaminated fish tissue that is consumed, the body weight of the consumer (average adult versus child), and the concentration of the contaminant. As shown in Table 10, these variables are considered together to derive recommended monthly consumption limits. Table 10 shows that as the concentration of DDT in tissue increases, the number of meals recommended declines. This risk based approach, based on consumption amount and tissue concentration, is also the method used by the NAS, FDA and OEHHA to develop their screening values (discussed above), and their respective screening values are also noted in Table 10. (It should be noted that the OEHHA screening values and FDA action level concentrations, which vary widely, are calculated based on different assumed consumption amounts.) Appendix 2 provides copies of the consumption advisory tables for other toxic substances that have been developed by USEPA.

The USEPA's draft guidance document provides a tool to develop monthly consumption screening values and/or regulatory values for fish and shellfish tissue that is the same as that used by OEHHA, the FDA, and the NAS in their development of their screening values and regulatory values. For example, Table 10 shows that DDT tissue concentrations at OEHHA's screening value of 100 ppb (0.1 ppm) would result in an advisory to not consume more than 30 meals of contaminated fish and shellfish tissue per month, for 4, 8, and 12 ounce meal sizes, and no more than 23 meals per month for 16 ounce meal sizes. Tissue concentrations at the FDA draft screening values of 5 ppm would result in an advisory of no more than 1-4 ounce meal per month, no more than 6-8 to 12 ounce meals per year, and no 16 ounce meals.

Table 10: Monthly Consumption Limits for Chronic Systemic Health Endpoints for the General Population-DDT

Chemical Concentration	Recommended Risk Based Consumption Limit (meals per month)[b]			
in Fish Tissue [a]	4 oz. Meal Size	8 oz. Meal Size	12 oz Meal Size	16 oz Meal Size
Mg/kg or ppm	(0.114 kg)	(0.227 kg)	(0.341 kg)	(0.454 kg)
<0.08	>30	>30	>30	>30
0.08	>30	>30	>30	29
0.09	>30	>30	>30	26
0.1 (OEHHA)	>30	>30	>30	23
0.2	>30	23	15	11
0.3	>30	15	10	7
0.4	23	11	7	5
0.5	18	9	6	4
0.6	15	7	5	3
0.7	13	6	4	3
0.8	11	5	3	2
0.9	10	5	3	2
1 (NAS)	9	4	3	2
2	4	2	1	1
3	3	1	1	6/yr
4	2	1	6/yr	6/yr
5 (FDA)	1	6/yr	6/yr	NONE
6	1	6/yr	6/yr	NONE
7	1	6/yr	NONE	NONE
8	1	6/yr	NONE	NONE
9	1	6/yr	NONE	NONE
10	6/yr	NONE	NONE	NONE
12	6/yr	NONE	NONE	NONE
14	6/yr	NONE	NONE	NONE
16	6/yr	NONE	NONE	NONE
18	6/yr	NONE	NONE	NONE
>18	NONE	NONE	NONE	NONE

None = No consumption recommended.
6/yr = Consumption of no more than 6 meals per year is recommended.
>30 + Although consumption of more than 30 meals/month is allowed, EPA advises limiting consumption to 30 meals in 1 month (1 meal per day)

[a] Instructions for modifying the variables in this Table are found in Section 3.3 of EPA's report. Consumption limits are based on an adult body weight of 70 kg and using a Reference Dose (RfD) = 5×10^{-4} mg/kg/d. References of RfDs can be found in Section 5 of the EPA report. The detection limit is 1×10^{-4} mg/kg.

[b] Monthly limits are based on the total dose allowable over a 1-month period (based on the RfD). When this dose is consumed in less than 1 month (e.g., in a few large meals), the daily dose will exceed the RfD.

Section 3.6 National Oceanic and Atmospheric Association (NOAA) Sediment Screening Values

Sediment chemistry data collected by the SWRCB/RWQCB's Bay Protection and Toxic Cleanup Program (BPTCP) are evaluated using the National Oceanic and Atmospheric Administration (NOAA) Sediment Screening Reference Guidelines (Appendix 3). (NOAA, SQRT, September 1999) These guidelines were developed for screening sediment to determine if the sediment can be disposed of in the ocean. These screening values are published in Screening Quick Reference Tables (Appendix 3). These sediment screening values, for inorganic and organic chemicals, are in the form of the Effects Range Low (ERL) and the Effects Range Median (ERM). The ERL is the lowest concentration of the chemical at which toxic effects to aquatic life were found in sediment, and the ERM is the median concentration of a chemical in sediment that causes toxicity to aquatic life that lives in the sediment. The NOAA screening values were developed by evaluating and statistically analyzing toxicity data for a wide range of aquatic species that live in sediment. These data were compiled from sediment toxicity research throughout the country. The SWRCB staff, as part of the BPTCP, identifies areas within the State where sediment concentrations of toxic substances exceed the ERM. Concentrations of toxic substances that exceed the ERM may pose a threat to aquatic life, and therefore indicate threatened violation of the Basin Plan narrative objective.

The sediment toxicity tests results were compared to a control to determine if there was a significant difference between the control response and the sample response. The benthic organism diversity and abundance data were used to calculate the Relative Benthic Index (RBI) to classify areas of Newport Bay as degraded, transitional, or not degraded in terms of benthic community diversity and abundance.

Section 3.7 Toxicity Screening Value

Regional Board staff used the chronic toxicity and Toxicity Identification Evaluation (TIE) and Toxicity Reduction Evaluation (TRE) procedures that have been adopted by the Regional Board in numerous NPDES permits for point source discharges to evaluate the water column aquatic toxicity data in the record. These procedures essentially require the completion of a TIE and a Toxicity Reduction Evaluation (TRE) whenever there is an exceedance of the following:

"Two-Month Median of Chronic Toxicity Test results Less than 1.0 TUc and all Single Test Results Less than 1.7 TUc (Test Species: *Ceriodaphnia dubia* for fresh water and *Americamysis bahia or Neomysis mercedis* for marine waters)"

Additionally, staff compared water quality data to existing water quality objectives (Table 3) and proposed USEPA water quality criteria (not yet adopted as water quality objectives) as an indication of aquatic life toxicity. These proposed criteria include those for diazinon and chlorpyrifos. Exceedances of these objectives or proposed criteria indicate that a chemical may be causing toxicity, but this needs to be confirmed by a Toxicity Identification Evaluation. Staff also compared water quality data to the State Department of Fish and Game's criteria for diazinon and chlorpyrifos, which is a recalculation of USEPA's proposed criteria for these pollutants using new acute toxicity test data not available to USEPA. The California Department of Fish and Game fresh water CMC and CCC for diazinon are 0.08 ppb and 0.05 ppb, and their CMC and CCC for chlorpyrifos are 0.02 ppb and 0.014 ppb. These criteria have also not been adopted as water quality objectives, and as such, were used as screening values in the evaluation. (CDFG, 94-1 and 94-2, 1994)

Section 4 Data Used in the Assessment of Violations of Water Quality Standards for Toxic Substances in Newport Bay and San Diego Creek

There is a significant amount of reliable, scientifically peer reviewed evidence in the record documenting violations of the narrative water quality objectives for toxic substances in Newport Bay and San Diego Creek. These data sources are discussed in more detail in the following sections and provide the basis for this problem statement.

As summarized in Section 3, and discussed below, there are a number of sources of water quality, sediment quality, toxicity, bioaccumulation, and benthic organism diversity and abundance data that have been used in this assessment. In summary, acute toxicity has been measured in toxicity tests of water and sediment samples collected from San Diego Creek and Newport Bay. TIEs show that discharges of waste pesticides are causing some of this toxicity. Toxic substance concentrations in the water column and sediment are thus adversely affecting beneficial uses. There is also evidence that toxic substances are bioaccumulating to levels that may pose a risk to human health and other biota.

Section 4.1 SWRCB Mussel Watch Data

The State Mussel Watch is a monitoring program conducted by the SWRCB, in coordination with the Regional Boards, that monitors the tissue of resident and transplanted mussels in salt water, and resident and transplanted clams in fresh water, for wet weight concentrations of a wide variety of toxic substances, including metals and pesticides. The SWRCB monitors tissue concentrations for toxic pollutants because many of these chemicals are not detected in routine water column monitoring but bioaccumulate in shellfish. The SMW Program (and the TSM Program discussed next) have been conducted on a Statewide basis every one or two years since 1987. The data are used to assess the spatial distribution of toxic substances in California waters and within specific watersheds, such as Newport Bay/San Diego Creek. The data from locations repeatedly sampled can also be used to assess trends over time. The SMW and TSMP reports are careful to include the caveat that the limited number of samples obtained and analyzed at each sampling station in a single year is generally too small to provide a statistically significant basis for making absolute statements about toxic substances concentrations. Therefore, the reports state that the data reported for a single year should be accepted as an indicator of relative levels of toxic pollution in water, not as absolute values. Trends over time and ranking values of a toxic substance in a particular species provide only an indication of areas where fish or shellfish appear to be accumulating concentrations above "normal." Clearly, the statistical significance of the data increases as more samples are collected. SMW and TSMP data for Newport Bay and San Diego Creek have been collected at repetitive locations since 1987, giving more weight to the data as indicators of toxic substance problems. Nevertheless, it is appropriate to keep the foregoing caveat in mind as these data are reviewed and assessed.

The SWRCB SMW Summary Report for 1987-93 provides mussel and clam tissue monitoring data from 9 monitoring stations in Newport Bay and 6 stations in the San Diego Creek watershed. (Figure 3) These data are included in Appendix 4. (SWRCB, SMW Data Base, 1996) Tables 11 and 12 below provide a summary of these data.

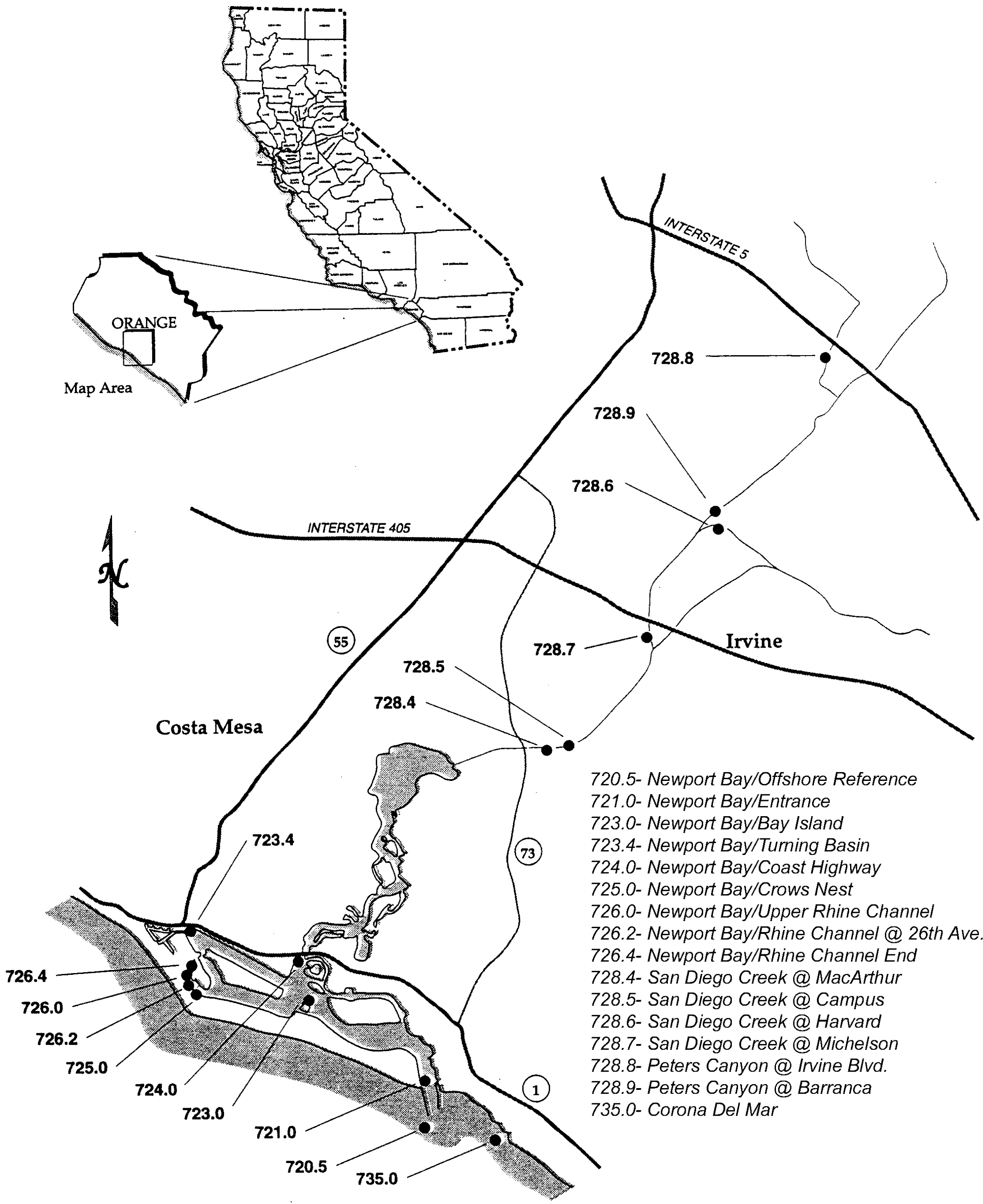

Figure 3: State Mussel Watch Monitoring Stations

Table 11 shows the maximum and minimum concentrations measured for each station and the number of samples collected from the beginning of the SMW sampling program through 1996. The concentrations of each metal across from each station name are the results of the most recent sample collected at the station. The screening values used to assess the data, and their source, are also shown. Where available, the OEHHA screening values have been used rather than the MIS or MTRL screening values since the OEHHA values are considered the most scientifically defensible. Where OEHHA values are not available, the MIS or MTRL values have been used. As previously discussed, the OEHHA, MIS, and MTRL screening values were developed to assess the potential effects to human consumers of tissue bioaccumulation in organisms. No screening values were found for silver. No screening values for metals in shellfish have been developed to assess the potential effects of tissue bioaccumulation on the organisms themselves.

As shown in Table 11, the screening values used for arsenic, cadmium, mercury, and selenium are from OEHHA, Table 9. The screening values used for chromium, copper, lead and zinc are the Median of the International Standards, Table 8. The screening value used for nickel is the MTRL for Inland Surface Waters, Table 6. The fresh water MTRL for nickel was used as the screening values because it is more conservative than the marine waters MTRL of 220 ppb. The SMW did not find concentrations of nickel and selenium above the screening values used. The following describes the concentrations of various metals found above the screening values.

Arsenic

As shown in Table 11, the SMW monitoring found that concentrations of arsenic in mussels exceeded the OEHHA screening value of 1.0 ppm in mussels collected from the Turning Basin, the Highway 1 Bridge and the Rhine Channel area. The SMW only analyzed samples for arsenic on two occasions, in 1994 and in 1996. Of the 7 samples analyzed for arsenic, all 7 exceeded the OEHHA screening value of 1.0 ppm, and ranged from 1.2 ppm to 1.5 ppm.

Cadmium

Cadmium was not found above the OEHHA screening value of 3.0 ppm at any of the locations sampled by the SMW between 1986 and 1996, except for one anomalous value of 9.7 ppm at the Police Docks in 1980. Concentrations of cadmium in clams from San Diego Creek range from 0.6 ppm to 1.5 ppm. Concentrations of cadmium in mussels from Newport Bay ranged from 0.83 ppm to 1.4 ppm.

Chromium

Chromium was found by the SMW above the MIS screening value of 1.0 ppm at the Turning Basin, in Rhine Channel, and at two tributary locations in San Diego Creek. However, the exceedances at the two tributary locations to San Diego Creek were prior to 1991, so these data are not sufficient to define a problem or average concentrations of chromium in clam tissue. The most recent San Diego Creek sample measurement (1996) was well below the screening value. The 1996 SMW monitoring again found chromium above the screening value in the Rhine Channel and at the screening value in the Turning Basin.

Copper

With the exception of an anomalous mussel sample collected in the Rhine Channel area in 1990, concentrations of copper in mussels and clams from Newport Bay and San Diego Creek range between 1.3 ppm and 9 ppm, which are below the MIS of 20 ppm. The highest copper concentrations were found in mussels from the Rhine Channel area, with the majority of the Bay and Creek stations showing copper concentrations in mussel and clam tissue in the range of 1 ppm to 3 ppm.

Lead

The SMW found high concentrations of lead in three samples in 1980, 1990, and 1991 at the Police Docks, Rhine Channel and a tributary creek to San Diego Creek. Other than that, the concentrations of lead in mussel and clam tissue were found to be below the MIS of 2.0 ppm. Additionally, the most recent samples for lead from the SMW show lead concentrations in mussels and clams to be below the MIS of 2.0 ppm. Therefore, lead does not appear to be bioaccumulating to levels of concern in either Newport Bay or San Diego Creek.

Mercury

The SMW found mercury in only one sample above the OEHHA screening values of 0.3 ppm, in the Rhine Channel in 1990. The remaining SMW data for mercury in clam and mussel tissue show concentrations below the screening value.

Zinc

Historically, zinc was found above the MIS of 70 ppm in the Rhine Channel and at the Police Docks. However, the most recent concentrations of zinc in clam and mussel tissue have been below the screening value, with concentrations in the range of 13 ppm to 50 ppm.

Table 11: Summary of Tissue Concentrations of Inorganic Toxic Substances In Resident and Transplanted Mussels and Clams (ppm) (SWRCB SMW 1987-96)(TCM=Transplanted California Mussel, TFC=Transplanted Freshwater Clam, and RCM=Resident California Mussel)

Station	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Values (ppm)				**1.000**	**3.000**	**1.000**	**20.000**	**0.300**	**28.000**	**2.000**	**20.000**	**70.000**
Source				**OEHHA**	**OEHHA**	**MIS**	**MIS**	**OEHHA**	**MTRL**	**MIS**	**OEHHA**	**MIS**
Newport Bay/Entrance	12/21/90	TCM	0.010	NA	1.200	0.350	1.700	0.030	NA	0.710	NA	43.000
Maximum			0.110	0.000	1.210	0.370	1.940	0.054	NA	1.500	NA	43.000
Minimum			0.002	0.000	0.320	0.160	1.020	0.015	NA	0.470	NA	26.000
Number of Samples			11.000	0.000	11.000	11.000	11.000	11.000	NA	11.000	NA	11.000
% Samples Above				0.000	0.000	0.000	0.000	0.000	NA	0.000	NA	0.000
Screening Value												
Newport Bay/Police Docks	12/30/82	TCM	0.008	NA	1.230	0.170	1.170	0.033	NA	0.630	NA	28.500
Maximum			0.067	NA	9.770	1.360	8.020	0.244	1.360	9.380	NA	171.200
Minimum			0.005	NA	0.630	0.150	0.970	0.024	0.230	0.630	NA	25.100
Number of Samples			5.000	NA	5.000	5.000	5.000	5.000	2.000	5.000	NA	5.000
% Samples Above				NA	20.000	20.000	0.000	0.000	0.000	20.000	NA	20.000
Screening Value												
Newport Bay/El Paseo Drive	12/23/86	TCM	0.006	NA	0.510	0.260	1.050	0.038	NA	0.250	NA	20.400
Newport Bay/Bay Island	12/22/91	TCM	0.005	NA	1.200	0.210	3.200	0.030	NA	0.600	NA	47.000
Maximum			0.012	NA	1.200	1.400	3.200	0.050	NA	1.380	NA	47.000
Minimum			0.001	NA	0.660	0.110	1.130	0.017	NA	0.550	NA	31.600
Number of Samples			9.000	NA	9.000	9.000	9.000	9.000	NA	9.000	NA	9.000
% Samples Above				NA	0.000	11.111	0.000	0.000	NA	0.000	NA	0.000
Screening Value												

Table 11: Summary of Tissue Concentrations of Inorganic Toxic Substances In Resident and Transplanted Mussels and Clams (ppm) (SWRCB SMW 1987-96)(TCM=Transplanted California Mussel, TFC=Transplanted Freshwater Clam, and RCM=Resident California Mussel)

Station	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Values (ppm)				**1.000**	**3.000**	**1.000**	**20.000**	**0.300**	**28.000**	**2.000**	**20.000**	**70.000**
Source				**OEHHA**	**OEHHA**	**MIS**	**MIS**	**OEHHA**	**MTRL**	**MIS**	**OEHHA**	**MIS**
Newport Bay/Turning Basin	1/17/96	TCM	0.006	1.200	1.500	1.000	3.000	0.038	1.000	0.580	0.200	50.000
Maximum			0.030	1.200	1.700	1.900	4.440	0.067	1.000	1.600	0.200	71.000
Minimum			0.003	1.200	0.800	0.160	2.170	0.023	1.000	0.540	0.200	38.700
Number of Samples			8.000	1.000	8.000	8.000	8.000	8.000	1.000	8.000	1.000	8.000
% Samples Above				100.000	0.000	12.500	0.000	0.000	0.000	0.000	0.000	12.500
Screening Value												
Newport Bay/Highway 1 Bridge	1/17/96	TCM	0.006	1.400	1.300	0.950	2.600	0.120	0.920	0.440	0.290	53.000
Maximum			0.013	1.500	1.900	0.950	7.000	0.120	0.920	1.170	0.290	75.000
Minimum			0.002	1.400	0.670	0.140	0.820	0.019	0.580	0.440	0.270	28.100
Number of Samples			14.000	2.000	14.000	14.000	14.000	14.000	2.000	14.000	2.000	14.000
% Samples Above				100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7.143
Screening Value												
Newport Bay/Dunes Dock	12/23/86	TCM	0.005	NA	1.140	0.390	1.400	0.089	NA	0.870	0.360	46.500
Newport Bay/Crows Nest	1/17/96	TCM	0.008	1.200	1.400	2.200	13.000	0.076	2.200	0.970	0.200	84.000
Maximum			0.021	1.500	1.700	2.500	21.000	0.108	2.200	2.360	0.310	88.000
Minimum			0.002	1.200	0.850	0.170	2.100	0.029	0.580	0.490	0.200	42.000
Number of Samples			15.000	2.000	15.000	15.000	15.000	15.000	2.000	15.000	2.000	15.000
% Samples Above				100.000	0.000	20.000	6.667	0.000	0.000	33.333	0.000	33.330
Screening Value												

Table 11: Summary of Tissue Concentrations of Inorganic Toxic Substances In Resident and Transplanted Mussels and Clams (ppm) (SWRCB SMW 1987-96)(TCM=Transplanted California Mussel, TFC=Transplanted Freshwater Clam, and RCM=Resident California Mussel)

Station	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Values (ppm)				**1.000**	**3.000**	**1.000**	**20.000**	**0.300**	**28.000**	**2.000**	**20.000**	**70.000**
Source				**OEHHA**	**OEHHA**	**MIS**	**MIS**	**OEHHA**	**MTRL**	**MIS**	**OEHHA**	**MIS**
Rhine Channel/Upper	12/20/88	TCM	0.007	NA	1.170	0.270	10.770	0.081	NA	1.900	NA	57.900
Maximum			0.012	2.200	1.600	0.550	12.610	0.091	NA	3.130	0.300	73.500
Minimum			0.007	2.200	0.740	0.250	2.960	0.039	NA	1.120	0.300	53.300
Number of Samples			7.000	1.000	7.000	7.000	7.000	7.000	NA	7.000	1.000	7.000
% Samples Above				100.000	0.000	0.000	0.000	0.000		42.857	0.000	28.571
Screening Value												
Rhine Channel/26th Ave.	12/23/86	TCM	0.005	NA	0.980	0.320	13.130	0.100	NA	1.270	NA	67.800
Rhine Channel/26th Ave.	12/20/88	TCM	0.004	NA	0.760	0.190	1.650	0.032	NA	0.500	NA	28.800
Rhine Channel/End	1/17/96	TCM	0.007	1.300	1.600	1.600	15.000	0.078	1.800	0.810	0.240	100.000
Maximum			0.014	1.400	2.700	1.600	26.000	0.159	1.800	2.600	0.270	100.000
Minimum			0.003	1.300	1.010	0.180	1.260	0.011	0.620	0.330	0.240	25.700
Number of Samples			10.000	2.000	10.000	10.000	10.000	10.000	2.000	10.000	2.000	10.000
% Samples Above				100.000	0.000	30.000	10.000	0.000	0.000	10.000	0.000	50.000
Screening Value												
San Diego Creek/MacArthur	3/17/93	TFC	0.015	NA	0.110	0.160	7.000	0.019	NA	0.040	NA	11.000
Maximum			0.024	NA	8.400	0.950	7.230	0.035	NA	0.220	NA	24.500
Minimum			0.004	NA	0.110	0.020	2.560	0.012	NA	0.040	NA	9.400
Number of Samples			8.000	NA	8.000	8.000	8.000	8.000	NA	8.000	NA	8.000
% Samples Above				NA	12.500	0.000	0.000	0.000	NA	0.000	NA	0.000
Screening Value												

Table 11: Summary of Tissue Concentrations of Inorganic Toxic Substances In Resident and Transplanted Mussels and Clams (ppm) (SWRCB SMW 1987-96)(TCM=Transplanted California Mussel, TFC=Transplanted Freshwater Clam, and RCM=Resident California Mussel)

Station	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Values (ppm)				**1.000**	**3.000**	**1.000**	**20.000**	**0.300**	**28.000**	**2.000**	**20.000**	**70.000**
Source				**OEHHA**	**OEHHA**	**MIS**	**MIS**	**OEHHA**	**MTRL**	**MIS**	**OEHHA**	**MIS**
San Diego Creek	3/14/90	TFC	0.008	NA	0.250	1.170	7.150	0.034	NA	0.760	NA	20.600
Maximum			0.024	NA	1.270	2.840	24.010	0.047	NA	0.800	NA	45.300
Minimum			0.005	NA	0.150	0.120	2.620	0.012	NA	0.070	NA	6.900
Number of Samples			6.000	NA	7.000	7.000	7.000	7.000	NA	7.000	NA	7.000
% Samples Above				NA	0.000	28.571	14.286	0.000	NA	0.000	NA	0.000
Screening Value												
Newport Bay/Entrance	12/12/80	RCM	0.287	NA	0.360	0.160	1.120	0.023	NA	1.260	NA	23.700
Maximum			0.323	NA	0.450	0.210	1.280	0.030	0.110	1.790	NA	24.600
Minimum			0.160	NA	0.200	0.160	0.990	0.019	0.110	0.660	NA	21.100
Number of Samples			4.000	NA	4.000	4.000	4.000	4.000	1.000	4.000	NA	4.000
% Samples Above				NA	0.000	0.000	0.000	0.000	0.000	0.000	NA	0.000
Screening Value												
Corona Del Mar	11/29/91	RCM	0.340	NA	0.300	0.160	1.100	0.020	NA	0.570	NA	31.000
Maximum			1.465	NA	0.570	0.510	1.800	0.063	0.280	2.540	NA	46.000
Minimum			0.340	NA	0.300	0.160	1.050	0.020	0.110	0.570	NA	28.500
Number of Samples			8.000	NA	8.000	8.000	8.000	8.000	4.000	8.000	NA	8.000
% Samples Above				NA	0.000	0.000	0.000	0.000	0.000	50.000	NA	0.000
Screening Value												

Table 12 below summarizes the 1987 - 1996 SMW tissue monitoring results for organic toxic pollutants. As in Table 11, the screening values used in the evaluation of the data are shown. These are OEHHA screening values, which are more stringent that the relevant NAS Guidelines and FDA Action Levels cited in Table 4. It is important to note that the concentrations of these organic toxic substances do not exceed the regulatory FDA Action Levels cited in Table 4. It is also important to note that the SMW monitoring shows a decline in the tissue concentrations of many of these organic pollutants over time. This declining trend is shown in Figures 1 through 11 in Appendix 4. This trend likely reflects the fact that many of these substances are no longer in use. However, these chemicals may be contributing to toxicity to aquatic life, which is discussed further below in the section pertaining to the Bay Protection and Toxic Cleanup Program (BPTCP).

In summary, the SMW data indicate bioaccumulation in shellfish of a number of previously used organic toxic substances to levels that suggest a potential public health concern to consumers. However, the OEHHA, the State agency responsible for issuing fish consumption advisories, does not believe that the SMW data are adequate to determine a threat to public health or to adequately characterize the average concentrations of toxic substances in fish tissue. The data suggest at least the threatened violation of the Basin Plan narrative objective that toxic substances not bioaccumulate to levels that are harmful to human health. The data also indicate, however, that the concentrations of these substances are declining over time.

The following summarizes the results of SMW mussel and clam tissue monitoring data for organic toxic substances.

Chlorbenside

There is no screening value for chlorbenside. Chlorbenside has been found in mussel and clam tissue in concentrations ranging from 4.7 to 15 ppb. However, chlorbenside has only been found in concentrations above the detection limit in 3 samples in the early 1980's, and has been not detected since that time.

Chlorpyrifos

Chlorpyrifos has been found to be bioaccumulating in mussel and clam tissue at concentrations ranging between 1 ppb and 45 ppb, which are well below the OEHHA screening value of 10,000 ppb.

Chlordane

Concentrations of chlordane in mussel and clam tissue range from 2 ppb to 225 ppb, some of which exceed the OEHHA screening value of 30 ppb. However, the SMW tissue monitoring data show concentrations of chlordane to be dropping over time. (See Figures 1-11 in Appendix 4) Additionally, the most recent mussel and clam tissue samples from all the stations monitored by the SMW showed chlordane concentrations to be below the OEHHA screening value of 30 ppb. Concentrations of chlordane found by the SMW during the 1990's range from 2.7 ppb to 17 ppb, which are all below the OEHHA screening value.

According to the USEPA draft tissue consumption guidelines (See Appendix 2), a concentration of 10 ppb or less of chlordane found in fish and shellfish samples collected from Newport Bay would not pose a risk to public health even if more than 30 meals per month are consumed.

Diazinon

Diazinon has been found to be bioaccumulating in mussel and clam tissue at concentrations ranging between <8 ppb and 30 ppb, which is well below the OEHHA screening value of 300 ppb. The highest concentration of diazinon was found in clam tissue from samples collected from San Diego Creek at MacArthur. Diazinon has only been detected by the SMW in 5 samples in the 1980's, and has not been detected during the 1990's.

According to the draft USEPA monthly consumption limits for diazinon a concentration of 30 ppb of diazinon in the tissue consumed would result in a recommendation to not consume more than 30, 4-ounce, meals per month and no more than 21, 16-ounce, meals per month. There is currently no evidence regarding the number of fish meals from Newport Bay per month being consumed by people fishing or collecting shellfish in Newport Bay. Again, OEHHA does not believe that current fish and shellfish tissue monitoring data are sufficient to warrant a fish consumption advisory for fish and shellfish from Newport Bay.

Total DDT

The SMW has found concentrations of total DDT in mussel and clam tissue that exceed the OEHHA screening value of 100 ppb. However, as shown in Figures 1-11 in Appendix 4, these concentrations have been dropping over time and the results of the most recent samples from the majority of the sampling stations in Newport Bay and San Diego Creek are now below the OEHHA screening value. The only exceptions are in the Rhine Channel in 1996, where the DDT concentration in the mussels was found to be 159 ppb, and Bay Island, where mussels were found to have 141 ppb of total DDT in 1991. Another Rhine

Channel sample showed 30 ppb of DDT in mussel tissue, in 1996. In the 1996 SMW sampling, mussel and clam tissue from the other Newport Bay and San Diego Creek monitoring stations were found to have DDT concentrations in the range of 23 ppb to 76 ppb.

According to the USEPA draft tissue consumption guidelines (See Table 10), a concentration of 80 ppb (0.08 ppm) or less of DDT found in fish and shellfish samples collected from Newport Bay would not pose a risk to public health even if more than 30 meals per month are consumed.

Dieldrin

Concentrations of dieldrin in mussel and clam tissue samples collected from Newport Bay and San Diego Creek follow the same pattern as DDT and chlordane. Dieldrin was found in mussel and clam tissue in the 1980's above the OEHHA screening value of 2 ppb. However, the concentrations of dieldrin in mussel tissue collected from Newport Bay have been dropping over time and the most recent (1996) samples of mussel and clam tissue, range from 0.8 ppb to 1.3 ppb. The 1996 clam tissue sample from San Diego Creek at MacArthur had a concentration of dieldrin of 2.8 ppb, which exceeds the OEHHA screening value of 2 ppb.

Endosulfan

The SMW did not find any concentrations of endosulfan above the OEHHA screening value of 20,000 ppb, in either Newport Bay or San Diego Creek. The SMW did find relatively high concentrations of endosulfan in clams at the San Diego Creek at MacArthur sampling station. As shown in Figures 1-11, Appendix 4, concentrations of endosulfan in mussel and clam tissue have been dropping over time. In 1996 the SMW did not detect endosulfan in mussel tissue from Newport Bay, and found 3.2 ppb of endosulfan in clam tissue from San Diego Creek.

Total PCBs

PCB concentrations in mussel and clam tissue samples collected from San Diego Creek and Newport Bay, between 1987 and 1996, range between 57 ppb and 560 ppb, which exceed the OEHHA and USEPA screening values of 20 ppb and 10 ppb, respectively. However, as shown in Figures 1-11 in Appendix 4, concentrations of PCBs in mussel and clam tissue from Newport Bay and San Diego Creek have been dropping over time. In 1996, the SMW found concentrations of PCB's in mussel tissue collected from Newport Bay in concentrations ranging from 19 ppb to 148 ppb, with the highest concentrations found in the Rhine Channel area. The concentration of total PCBs in fresh water clams collected from San Diego Creek at MacArthur in 1993 was 27 ppb.

According to the USEPA draft tissue consumption guidelines, a concentration of 50 ppb of PCBs found in fish and shellfish samples collected from Newport Bay may pose a threat to public health if more than 7 meals of fish/shellfish are consumed per month, but OEHHA does not believe that current fish and shellfish tissue monitoring data are sufficient to warrant a fish consumption advisory for fish and shellfish from Newport Bay, or to determine the average concentration of PCBs in fish and shellfish from Newport Bay.

Toxaphene

Although historic concentrations of toxaphene in mussel and clam tissue from Newport Bay and San Diego Creek exceeded the OEHHA screening value of 30 ppb, the most recent sampling conducted by the SMW program did not detect toxaphene in mussel and clam tissue collected from the Bay or the Creek, with one exception (at San Diego Creek at MacArthur in 1993).

According to the USEPA draft tissue consumption guidelines, a concentration of 60 ppb or less of toxaphene found in fish and shellfish samples collected from Newport Bay would not pose a risk to public health even if more than 30 meals per month are consumed.

Table 12: Summary of Organic Toxic Substances In Resident and Transplanted Mussels and Clams (ppb) (SWRCB SMW 1977-96)

	Date	Species	Chlordane	Chlorpyrifos	DDT	Diazinon	Dieldrin	Endrin	Toxaphene	PCBs
Screening Values (ppb)			**30.00**	**10000.00**	**100.00**	**300.00**	**2.00**	**100.00**	**30.00**	**20.00**
Source			**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**
Newport Bay/Entrance	12/21/90	TCM	2.67	ND	18.43	ND	0.70	ND	ND	6.03
Maximum			25.47	1.06	170.47	ND	3.60	ND	38.42	45.12
Minimum			2.67	ND	18.43	ND	0.70	ND	ND	6.03
Number of Samples			9.00	9.00	9.00	7.00	7.00	7.00	9.00	9.00
% Above Screening Value			0.00	0.00	44.44	0.00	42.86	0.00	11.11	88.89
Newport Bay/Police Docks	1/1/86	TCM	27.89	ND	162.49	ND	3.95	ND	ND	60.80
Maximum			31.27	ND	306.33	ND	6.44	ND	ND	94.40
Minimum			4.00	ND	11.35	ND	3.85	ND	ND	38.50
Number of Samples			4.00	4.00	4.00	3.00	3.00	3.00	4.00	4.00
% Above Screening Value			50.00	0.00	75.00	0.00	100.00	0.00	0.00	100.00
Newport Bay/El Paseo Drive	12/23/86	TCM	21.30	ND	142.70	ND	4.90	ND	ND	64.80
Newport Bay/Bay Island	12/22/91	TCM	14.80	ND	141.10	NA	2.30	ND	ND	66.00
Maximum			65.58	1.00	599.74	ND	6.50	ND	35.36	108.00
Minimum			4.69	ND	22.51	ND	0.78	ND	ND	7.31
Number of Samples			10.00	10.00	10.00	7.00	8.00	9.00	10.00	10.00
% Above Screening Value			50.00	0.00	90.00	0.00	70.00	0.00	10.00	90.00
Newport Bay/Turning Basin	1/17/96	TCM	6.01	ND	22.82	ND	0.82	ND	ND	19.01
Maximum			28.27	1.14	107.60	ND	9.20	ND	15.65	73.20
Minimum			6.01	ND	22.82	ND	0.82	ND	ND	8.65
Number of Samples			8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Number of Samples			0.00	0.00	12.50	0.00	12.50	0.00	12.50	87.50
% Above Screening Value										

Table 12: Summary of Organic Toxic Substances In Resident and Transplanted Mussels and Clams (ppb) (SWRCB SMW 1977-96)

	Date	Species	Chlordane	Chlorpyrifos	DDT	Diazinon	Dieldrin	Endrin	Toxaphene	PCBs
Screening Values (ppb)			**30.00**	**10000.00**	**100.00**	**300.00**	**2.00**	**100.00**	**30.00**	**20.00**
Source			**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**
Newport Bay/Highway 1 Bridge	1/17/96	TCM	9.26	ND	72.60	ND	1.18	ND	ND	18.48
Maximum			48.39	9.10	385.56	6.60	7.68	ND	87.12	89.27
Minimum			9.26	0.75	44.45	6.60	1.18	ND	ND	11.50
Number of Samples			14.00	14.00	14.00	11.00	13.00	13.00	14.00	14.00
% Above Screening Value			21.43	0.00	71.43	0.00	57.14	0.00	28.57	71.43
Newport Bay/Dunes Dock	12/23/86	TCM	14.70	ND	144.50	ND	5.60	ND	ND	57.60
Newport Bay/Crows Nest	1/17/96	TCM	10.09	ND	159.13	ND	1.31	ND	ND	148.48
Maximum			65.32	1.40	280.26	0.00	13.02	ND	50.88	571.29
Minimum			6.30	ND	36.58	ND	1.31	ND	ND	44.09
Number of Samples			13.00	13.00	13.00	10.00	11.00	11.00	13.00	15.00
% Above Screening Value			0.00	0.00	53.33	0.00	60.00	0.00	6.67	100.00
Newport Bay/Rhine Channel/Upper	12/20/88	TCM	NA	NA	NA	NA	NA	NA	NA	273.60
Maximum			221.77	2.98	198.28	ND	13.41	ND	ND	473.80
Minimum			33.58	ND	129.30	ND	12.13	ND	ND	96.00
Number of Samples			4.00	4.00	4.00	2.00	2.00	2.00	3.00	7.00
% Above Screening Value			14.29	0.00	57.14		28.57	0.00	0.00	100.00
Newport Bay/Rhine Channel/26th Ave	12/20/88	TCM	13.95	1.19	75.49	3.56	3.35	ND	ND	21.60
Newport Bay/Rhine Channel/End	1/17/96	TCM	5.37	ND	30.02	ND	0.92	ND	ND	102.01
Maximum			32.81	3.77	208.26	5.85	5.20	ND	22.15	630.00
Minimum			ND	ND	2.53	ND	ND	ND	ND	8.93
Number of Samples			11.00	11.00	11.00	9.00	11.00	ND	11.00	12.00
% Above Screening Value			0.00	0.00	16.67	0.00	41.67	0.00	0.00	91.67

Table 12: Summary of Organic Toxic Substances In Resident and Transplanted Mussels and Clams (ppb) (SWRCB SMW 1977-96)

	Date	Species	Chlordane	Chlorpyrifos	DDT	Diazinon	Dieldrin	Endrin	Toxaphene	PCBs
Screening Values (ppb)			**30.00**	**10000.00**	**100.00**	**300.00**	**2.00**	**100.00**	**30.00**	**20.00**
Source			**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**
San Diego Creek at MacArthur	3/17/93	TFC	11.10	42.00	76.00	NA	2.80	ND	110.00	27.00
Maximum			66.34	45.92	802.78	30.60	10.66	20.70	278.80	74.29
Minimum			10.06	0.85	76.00	ND	0.85	ND	ND	17.04
Number of Samples			7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00
% Above Screening Value			0.00	0.00	71.43	0.00	71.43	0.00	42.86	85.71
San Diego Creek	1/23/91	SED	13.89	ND	10.63	ND	ND	ND	ND	ND
Maximum			62.98	56.00	327.25	ND	3.80	ND	217.00	34.00
Minimum			10.00	ND	10.63	ND	ND	ND	38.00	ND
Number of Samples			7.00	7.00	7.00	6.00	7.00	ND	7.00	7.00
% Above Screening Value			0.00	0.00	42.86	0.00	42.86	7.00	57.14	28.57
Corona Del Mar	11/29/91	RCM	0.90	0.80	16.30	NA	0.50	ND	ND	11.00
Maximum			9.07	0.80	41.15	ND	1.38	ND	ND	41.25
Minimum			0.90	ND	5.58	ND	0.50	ND	ND	8.27
Number of Samples			4.00	4.00	8.00	3.00	4.00	4.00	4.00	8.00
% Above Screening Value			0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00

TFC=Transplanted Fresh Water Clam
RCM= Resident California Mussel
TCM=Transplanted California Mussel

Section 4.2 Toxic Substances Monitoring Program Data

The SWRCB's Toxic Substances Monitoring program (TSM) collects samples of fish from inland surface waters of the State, including San Diego Creek, and analyzes the fish tissue for toxic substances. Marine species are also collected on occasion (including fish from Newport Bay). This program, like the State Mussel Watch Program, collects screening level data to evaluate bioaccumulation of toxic substances in animal tissue to determine if there is sufficient bioaccumulation to pose a threat to beneficial uses of the waters of the State. These data are used to focus subsequent investigations. Since the TSMP collects a limited number of fish tissue samples from Newport Bay and San Diego Creek, it is important to note again that these data are not adequate to make definite conclusions regarding the threat to public health posed by the consumption of fish and shellfish from the Bay and Creek.

As part of the TSM, fish samples have been collected from San Diego Creek and Newport Bay beginning in 1981. (Figure 4) The most recent TSMP monitoring was conducted in 1995, and included three sample locations in Newport Bay and five tributary sample locations in the Newport Bay Watershed. Appendix 5 includes all the TSMP data collected for Newport Bay and its tributaries. This includes monitoring data for fish tissue concentrations for metals and organic toxic substances, including a number of pesticides. The TSMP has collected 10 to 20 samples from Peters Canyon Channel at Barranca and San Diego Creek at Michelson over the past 20 years, which provides a more statistically significant characterization of tissue concentrations at these locations.

The TSMP analyzes the collected fish tissue for 47 different toxic organic substances and 10 heavy metals. Table 13 below summarizes the TSMP data in Appendix 5 for organic toxic substances. (SWRCB, TSMP Data Base, 1996) Table 14 summarizes the results of inorganic toxic substances. These tables show the number of samples from each station, the species of fish analyzed, the most recent result for each chemical, and maximum, and minimum of all data for each chemical for each station monitored by the TSMP.

Tables 13 and 14 also indicate whether the whole fish or only a filet of the fish was analyzed. The whole fish is usually analyzed when the fish are small. This does not represent typical human consumption practices, but does reflect what predator species consume. Whole fish concentrations may be 2 to 10 times the concentration found in filets, and the filets of the fish are what are typically consumed by people. There have only been 7 analyses of fish filets from Newport Bay by the TSMP; the remainder have been whole fish analyses. The NAS Guidelines (Table 5) are based on whole fish and are used to screen the data for specific pollutants for potential ecological effects. For many pollutants only regulatory and screening values (FDA, OEHHA, MIS, and USEPA) that are based on the edible portion of the fish, rather than whole fish, are available. These screening values have been used in evaluating the data in absence of or as a supplement to the NAS Guidelines. (It is interesting to note that with the exception of endosulfan and endrin, the NAS Guidelines are less stringent than the OEHHA screening values.) Thus, the data must be evaluated with caution. To reiterate, the TSMP data are not adequate for determining whether there is a threat to public health resulting from the consumption of fish from the Bay.

As shown in Table 14, the screening values used for arsenic, cadmium, mercury, and selenium are from OEHHA, Table 9. The screening values used for chromium, copper, lead and zinc are the Median of the International Standards, Table 8. The screening value used for nickel is the MTRL for Inland Surface Waters, Table 6. The fresh water MTRL for nickel was used as the screening values because it is more conservative than the marine waters MTRL of 220 ppb.

Both the USEPA and the State of California OEHHA have used a screening value for selenium in fish tissue that is an order of magnitude greater than the MIS. Based on the USEPA and OEHHA screening values (which also rely on fish filet analyses rather than whole body) (see Table 9, Section 3) for selenium of 30 ppm and 20 ppm, respectively, the data do not indicate any threat to public health as the result of fish consumption. There are no FDA of NAS criteria for selenium. It is not known whether the concentrations of selenium measured in fish tissue pose a threat to the health of aquatic organisms or predators. This is also shown in Tables 4-11 and 4-12 in Appendix 2, which provide USEPA's risk based calculations for selenium in fish tissue for the general population and children.

The following is a discussion of the TSM monitoring data, summarized in Tables 13 and 14, and included in Appendix 5.

Total Chlordane

In the 1980’s, the TSM found concentrations of total chlordane above the NAS Guideline (100 ppb) in San Diego Creek and Peters Canyon Wash. However, in the 1990’s, total chlordane concentrations have declined to levels below the NAS Guideline. Fish filets from Newport Bay have shown total chlordane concentrations less than the OEHHA screening value.

Diazinon

Diazinon has been found to be sporadically bioaccumulating in whole red shiner tissue samples collected from San Diego Creek and tributaries at concentrations ranging between 74 ppb and 440 ppb. Most of the TSM fish tissue data from Newport Bay and San Diego Creek show diazinon concentrations <50 ppb, and when diazinon is detected the majority of whole fish samples had concentrations below the OEHHA screening value of 300 ppb

Total DDT

Concentrations of total DDT exceeding the NAS Guideline (1000 ppb) have been measured in whole red shiners collected from San Diego Creek, the Santa Ana Delhi Channel, and Peters Canyon Wash. The most recent (1995) data from two of the three locations (San Diego Creek and Peters Canyon Wash) indicate tissue concentrations have declined; however, the measured values for Peters Canyon Wash sample remained close to the NAS Guideline.

The TSM has found concentrations of total DDT in whole fish tissue samples, from both Newport Bay and San Diego Creek that exceed the OEHHA screening value of 100 ppb. Historically (1990-91), the TSM also found concentrations of DDT in fish filet samples from Newport Bay to be above the OEHHA screening value, in the range of 110 ppb to 277 ppb. However, as shown in Figures 1-5 in Appendix 5, these concentrations have been dropping over time. The most recent sample of fish filet tissue from Newport Bay (1995, Black Croaker) had 66 ppb of DDT, which is less than the OEHHA screening value. The most recent TSM monitoring (1995) did show concentrations of DDT in whole fish tissue samples collected from San Diego Creek, and tributaries, to still be above the OEHHA screening value, in the range of 400 ppb to 700 ppb. Since these data are for whole fish samples they are not indicative of a level of contamination that human consumers would be exposed to, but do indicate the concentrations of DDT exposure to predators of the fish from San Diego Creek.

Dieldrin

The TSM has not detected concentrations of dieldrin in fish filet samples from Newport Bay. The TSM has found concentrations of dieldrin in whole fish tissue samples from both Newport Bay and San Diego Creek, that exceed the OEHHA screening value of 2 ppb. As shown in Figures 1-5 in Appendix 5, concentrations of dieldrin in whole fish samples from San Diego Creek have been dropping over time. The most recent TSM monitoring (1995) did show concentrations of dieldrin in whole fish tissue samples collected from San Diego Creek, and tributaries, to still be above the OEHHA screening value, in the range of 7 ppb to 10 ppb. Since these data are for whole fish samples they are not indicative of a level of contamination that human consumers would be exposed to, but do indicate the concentrations of dieldrin exposure to predators of the fish from San Diego Creek. Concentrations of dieldrin measured in whole red shiners in Peters Canyon Wash in 1989 exceeded the NAS guideline of 100 ppb. However, the most recent concentrations of dieldrin found by the TSM, in samples from the wash and San Diego Creek are well below the NAS Guideline.

Endosulfan

The TSM did not find any concentrations of endosulfan above the OEHHA screening value of 20 ppm (20,000 ppb) in fish filet samples from Newport Bay. Historically (1987-89), the TSM did find concentrations of endosulfan in whole fish samples from San Diego Creek and Peters Canyon Wash that exceed the NAS Guideline (100 ppb). As shown in Figures 1-5, Appendix 5, concentrations of endosulfan in whole fish samples have dropped substantially over time. In 1995 the TSM did not analyze samples for endosulfan in fish tissue from Newport Bay and San Diego Creek because of this declining trend and the fact that samples collected in the early 1990's were below screening values. Concentrations of endosulfan in whole fish samples from San Diego Creek in 1990 were less than 7 ppb.

Total PCBs

The TSM found concentrations of PCBs in fish filet tissue samples collected from Newport Bay, between 1986 and 1991, in the range between 95 ppb and 135 ppb, which exceed the OEHHA and USEPA screening values of 20 ppb and 10 ppb, respectively. In 1995, the TSM found concentrations of PCB's in black croaker filet tissue collected from Newport Bay to be less than 50 ppb. This declining trend is reflected also in PCB data from San Diego Creek. In the early 1980's, PCB concentrations measured in whole red shiners approached or exceeded the NAS Guideline of 500 ppb. However, as shown in Figures 1-5 in Appendix 5, concentrations of PCBs in fish filet and whole fish samples from Newport Bay and San Diego Creek have been dropping over time. Between 1983 and 1993, the TSM found concentrations of PCBs in whole fish samples from San Diego Creek and tributaries ranging from 64 ppb to 560 ppb. In 1995, the concentration of total PCBs in whole red shiners collected from San Diego at MacArthur was 58 ppb.

According to the USEPA draft tissue consumption guidelines, a concentration of 50 ppb of PCBs found in fish and shellfish samples collected from Newport Bay may pose a threat to public health if more than 7 meals of fish/shellfish are consumed per month, but OEHHA does not believe that current fish and shellfish tissue monitoring data are sufficient to warrant a fish consumption advisory for fish and shellfish from Newport Bay, or to determine the average concentration of PCBs in fish and shellfish from Newport Bay.

Toxaphene

Although historic concentrations of toxaphene in fish filet tissue Newport Bay exceeded the OEHHA screening value of 30 ppb, the most recent sampling (1995) conducted by the TSM program did not detect toxaphene in fish filet tissue. The TSM has historically found concentrations of toxaphene in whole fish samples from San Diego Creek and tributaries in the range of 120 ppb to 7700 ppb, which exceed the NAS Guideline of 100 ppb. However, as shown in Figures 1-5 (Appendix 5), concentrations of toxaphene in whole fish samples from the TSM monitoring stations have been dropping over time. In 1995, the TSM found concentrations of toxaphene in whole fish samples to be less than 100 ppb in samples from San Diego Creek. The 1995 concentration of toxaphene in whole fish samples from Peters Canyon Wash (540 ppb) remained above the NAS Guideline but was substantially lower than the 1300-1400 ppb measurements in 1989.

According to the USEPA draft tissue consumption guidelines, a concentration of 60 ppb or less of toxaphene found in fish and shellfish samples collected from Newport Bay would not pose a risk to public health even if more than 30 meals per month are consumed.

Arsenic

As shown in Table 14, the TSM monitoring found that concentrations of arsenic in fish filet tissue from samples collected from Newport Bay exceeded the OEHHA screening value of 1.0 ppm. However, the TSM did not find arsenic above the screening value of 1.0 ppm in any of the whole fish samples collected from San Diego Creek and tributaries.

Cadmium

Cadmium was not found above the OEHHA screening value of 3.0 ppm at any of the locations sampled by the TSM between 1983 and 1995. Concentrations of cadmium in whole fish samples from San Diego Creek range from 0.1 ppm to 0.15 ppm. The concentration of cadmium in fish filet samples from Newport Bay was between <0.01 and 0.76 ppm.

Chromium

Chromium was not found in concentrations above the MIS of 1.0 ppm in any of the whole fish or fish filet samples collected from San Diego Creek and Newport Bay.

Copper

Copper was not found in concentrations above the MIS of 20.0 ppm in any of the whole fish or fish filet samples collected from San Diego Creek and Newport Bay, except for one anomalous sample of whole red shiner collected in June of 1986.

Lead

Lead was not found in concentrations above the MIS of 2.0 ppm in any of the whole fish or fish filet samples collected from San Diego Creek and Newport Bay, except for one anomalous sample of black perch collected in June of 1992.

Mercury

Mercury was not found in concentrations above the OEHHA screening value of 0.3 ppm in any of the whole fish or fish filet samples collected from San Diego Creek and Newport Bay.

Zinc

Zinc was not found in concentrations above the MIS of 70 ppm in any of the whole fish or fish filet samples collected from San Diego Creek and Newport Bay.

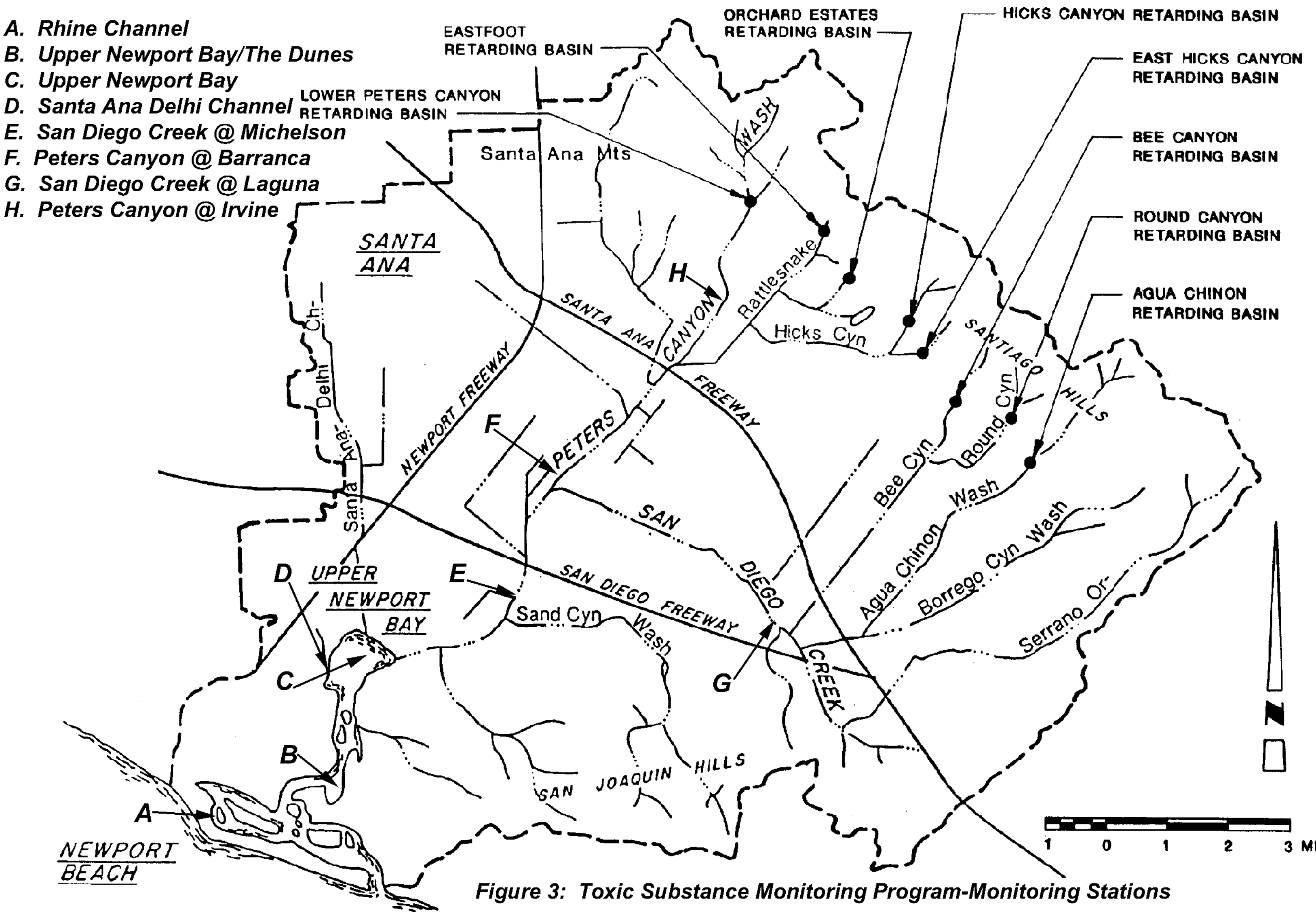

Figure 3: Toxic Substance Monitoring Program-Monitoring Stations

Table 13: Summary of Organic Toxic Substances Monitoring Program Data (SWRCB TSMP 1981-97)

	Date	Species	Total Chlordane	Chlorpyrifos	Total DDT	Diazinon	Dieldrin
Screening Values (ppb)			**30.000**	**10000.000**	**100.000**	**300.000**	**2.000**
Source			**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**
Station							
San Diego Creek/Upper Newport Bay	5/19/93	California Killifish	31.500	-10.000	364.000	-50.000	-5.000
Maximum		Whole Fish)	49.500	-10.000	694.000	-50.000	10.000
Minimum			30.900	-10.000	353.000	-50.000	-5.000
Number of Samples			5.000	5.000	5.000	5.000	5.000
% Samples above			0.000	0.000	100.000	0.000	20.000
Screening Value							
Delhi Channel	7/1/85	Goldfish (Whole)	17.600	-10.000	140.000	-50.000	-5.000
San Diego Creek/Michelson Drive	6/17/95	Red Shiner	39.300	55.000	400.000	-50.000	8.800
Maximum		(Whole Fish)	348.000	82.000	5101.000	440.000	80.000
Minimum			15.000	-10.000	367.000	-50.000	-5.000
Number of Samples			19.000	19.000	19.000	19.000	19.000
% Samples above			50.000	0.000	100.000	5.556	83.333
Screening Value							
San Diego Creek/Barranca Parkway	5/19/93	Red Shiner	14.600	-10.000	386.000	-50.000	-5.000
Maximum		(Whole Fish)	203.000	-10.000	2896.000	-50.000	34.000
Minimum			14.600	-10.000	386.000	-50.000	-5.000
Number of Samples			7.000	7.000	7.000	7.000	7.000
% Samples above			28.571	0.000	100.000	0.000	85.714
Screening Value							
El Modena Channel	5/16/91	Red Shiner	157.000	18.000	3986.000	-50.000	15.000
		(Whole Fish)					

Table 13: Summary of Organic Toxic Substances Monitoring Program Data (SWRCB TSMP 1981-97)

	Date	Species	Total Chlordane	Chlorpyrifos	Total DDT	Diazinon	Dieldrin
Screening Values (ppb)			**30.000**	**10000.000**	**100.000**	**300.000**	**2.000**
Source			**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**	**OEHHA**
Station							
Peters Canyon Channel	6/17/95	Red Shiner	27.900	40.000	707.000	74.000	7.000
Maximum		(Whole Fish)	143.600	120.000	2720.000	180.000	140.000
Minimum			27.900	-10.000	707.000	-50.000	5.400
Number of Samples			9.000	9.000	9.000	9.000	9.000
% Samples above			33.300	0.000	100.000	0.000	100.000
Screening Value							
Newport Bay	6/18/95	Black Croaker	NA	-10.000	66.000	-50.000	-5.000
Maximum		(Filet)	7.700	-10.000	277.000	-50.000	-5.000
Minimum			5.400	-10.000	48.000	-50.000	-5.000
Number of Samples			2.000	4.000	4.000	4.000	4.000
% Samples above			0.000	0.000	50.000	0.000	0.000
Screening Value							

Table 13: Summary of Organic Toxic Substances Monitoring Program Data (SWRCB TSMP 1981-97)							
	Date	**Species**	**Total Endosulfan**	**Endrin**	**Total HCH**	**Total PCB**	**Toxa-phene**
Screening Values (ppb)			**100.000**	**100.000**	**30.000**	**20.000**	**30.000**
Source			**NAS**	**NAS**	**OEHHA**	**OEHHA**	**OEHHA**
Station							
San Diego Creek/Upper Newport Bay	5/19/93	California Killifish	ND	-15.000	NA	NA	-100.000
Maximum		(Whole Fish)	ND	-15.000	0.000	140.000	210.000
Minimum			ND	-15.000	0.000	96.000	-100.000
Number of Samples			2.000	5.000	0.000	3.000	5.000
% Samples above			0.000	0.000	0.000	100.000	20.000
Screening Value							
Delhi Channel	7/1/85	Goldfish (Whole)	NA	-15.000	3.100	240.000	-100.000
San Diego Creek/Michelson Drive	6/17/95	Red Shiner	NA	-15.000	NA	58.000	-100.000
Maximum		(Whole Fish)	335.000	28.000	19.000	560.000	1800.00
Minimum			6.600	-15.000	2.800	58.000	-100.000
Number of Samples			9.000	19.000	7.000	16.000	19.000
% Samples above			33.300	0.000	0.000	100.000	94.444
Screening Value							
San Diego Creek/Barranca Parkway	5/19/93	Red Shiner	ND	-15.000	NA	NA	130.000
Maximum		(Whole Fish)	312.000	-15.000	14.000	256.000	570.000
Minimum			6.200	-15.000	14.000	62.000	130.000
Number of Samples			2.000	7.000	1.000	5.000	7.000
% Samples above			33.300	0.000	0.000	100.000	100.000
Screening Value							
El Modena Channel	5/16/91	Red Shiner	5.600	-15.000	NA	362.000	500.000
		(Whole Fish)					

Table 13: Summary of Organic Toxic Substances Monitoring Program Data (SWRCB TSMP 1981-97)							
	Date	**Species**	**Total Endosulfan**	**Endrin**	**Total HCH**	**Total PCB**	**Toxa-phene**
Screening Values (ppb)			**100.000**	**100.000**	**30.000**	**20.000**	**30.000**
Source			**NAS**	**NAS**	**OEHHA**	**OEHHA**	**OEHHA**
Station							
Peters Canyon Channel	6/17/95	Red Shiner	NA	-15.000	NA	NA	540.000
Maximum		(Whole Fish)	130.000	-15.000	12.000	148.000	2200.00
Minimum			110.000	-15.000	8.300	64.000	260.000
Number of Samples			2.000	9.000	3.000	4.000	9.000
% Samples above			100.000	0.000	0.000	75.000	100.000
Screening Value							
Newport Bay	6/18/95	Black Croaker	NA	-15.000	NA	NA	-100.000
Maximum		(Filet)	10.000	-15.000	0.000	135.000	-100.000
Minimum			10.000	-15.000	0.000	95.000	-100.000
Number of Samples			1.000	4.000	0.000	2.000	4.000
% Samples above			0.000	0.000	0.000	100.000	0.000
Screening Value							

Minus sign = Less Than (<)

Table 14: Summary of Inorganic Toxic Substances Monitoring Program Data (ppm) (SWRCB TSMP 1981-97)

	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Value Source				**1.0 OEHHA**	**3.0 OEHHA**	**1.0 MIS**	**20.0 MIS**	**0.3 OEHHA**	**28.0 MTRL**	**2.0 MIS**	**20.0 OEHHA**	**70.0 MIS**
Station												
Upper Newport Bay	4/18/84	Longjaw Mudsucker	-0.020	0.400	0.030	0.070	0.470	-0.020	-0.100	0.100	1.400	17.000
Upper Newport Bay	7/1/85	Longjaw Mudsucker	-0.020	0.400	0.030	0.030	0.400	-0.020	0.100	-0.100	1.300	17.000
Delhi Channel	7/1/85	Goldfish (Whole Fish)	ND	ND	ND	ND	ND	0.050	ND	ND	ND	ND
SDC/Michelson	6/17/95	Red Shiner	-0.020	0.170	0.130	0.090	1.400	0.020	-0.100	-0.100	1.100	29.000
Maximum		(Whole Fish)	0.040	0.200	0.290	0.090	23.000	0.150	0.200	0.200	1.600	49.000
Minimum			-0.020	-0.100	0.030	-0.040	0.540	0.020	-0.100	-0.100	0.290	14.000
Number of Samples			19.000	19.000	19.000	19.000	19.000	19.000	19.000	19.000	18.000	19.000
% Samples Above			0.000	0.000	0.000	0.000	5.263	0.000	0.000	0.000	0.000	0.000
Screening Value												
SDC/Barranca	7/23/87	Red Shiner	0.010	0.090	0.320	0.060	1.500	0.020	-0.100	-0.100	1.600	24.000
Maximum		(Whole Fish)	0.010	0.130	0.320	0.090	1.500	0.050	0.100	-0.100	1.600	40.000
Minimum			-0.020	-0.050	0.080	-0.020	0.800	0.020	-0.100	-0.100	0.830	15.000
Number of Samples			6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000
% Samples Above				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Screening Value												
El Modena/Walnut	5/16/91	Red Shiner	-0.020	-0.050	0.310	0.030	1.100	0.080	-0.100	-0.100	1.100	38.000
		(Whole Fish)										

Table 14: Summary of Inorganic Toxic Substances Monitoring Program Data (SWRCB TSMP 1981-97)

	Date	Species	Silver	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
Screening Value Source				**1.0 OEHHA**	**3.0 OEHHA**	**1.0 MIS**	**20.0 MIS**	**0.3 OEHHA**	**28.0 MTRL**	**2.0 MIS**	**20.0 OEHHA**	**70.0 MIS**
Station												
Peters Canyon	6/17/95	Red Shiner	-0.020	0.090	0.140	0.070	1.400	0.020	-0.100	-0.100	1.300	38.000
Maximum		(Whole Fish)	-0.020	0.240	0.240	0.180	1.400	0.080	0.100	0.100	1.600	46.000
Minimum			-0.020	0.070	0.100	-0.020	0.850	-0.020	-0.100	-0.100	1.100	21.000
Number of Samples			9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
% Samples Above				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Screening Value												
Newport Bay	6/18/95	Black Croaker	-0.020	ND	ND	-0.020	3.100	ND	ND	-0.100	ND	20.000
Maximum		(Filet)	-0.020	2.000	0.760	-0.020	3.500	0.260	-0.100	5.000	0.540	29.000
Minimum			-0.020	1.200	-0.010	-0.020	1.400	0.030	-0.100	-0.100	0.250	18.000
Number of Samples			4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
% Samples Above			0.000	50.000	0.000	0.000	0.000	0.000	0.000	12.500	0.000	0.000
Screening Value												

Minus sign = Less Than (<)

Section 4.3 Office of Environmental Health Hazard Assessment (OEHHA) Fish Tissue Monitoring Data

As discussed above in the sections regarding the SMW and TSM tissue monitoring data, the OEHHA does not believe that the SMW and TSM tissue data are sufficient to determine the average concentrations of toxic substances in fish and mussel tissue and does not use the data to issue fish and shellfish consumption advisories. OEHHA, like the SWRCB and the Regional Board staff, use the SMW and TSM tissue monitoring data to screen for toxic substances, and areas where there may be bioaccumulation of toxic substances that require further investigation. The SMW and TSM data are used only to screen for further investigations because the data are not statistically significant and does not consider fish and shellfish consumption practices.

In 1999, OEHHA collected fish samples from Newport Bay and analyzed two composite samples of fish filets to determine concentrations of toxic substances in fish filets that would likely be consumed by people fishing in Newport Bay. Appendix 6 includes the OEHHA fish filet monitoring data for Newport Bay, and offshore monitoring sites along Newport Beach. (The data from offshore sites is included for reference.) (OEHHA, unpublished data, December 2000) These tissue monitoring data from OEHHA appear to confirm the decreasing trend in concentrations of DDT, PCBs, dieldrin, chlordane, endosulfan, and toxaphene, shown by the SMW and TSM data. This monitoring by OEHHA found that only concentrations of PCBs in one of the two composite samples, the Diamond Turbot, exceeded the OEHHA screening values for human consumption. The concentration of PCBs in the Shiner Surfperch sample collected from Newport Bay was less than the OEHHA screening values.

Section 4.4 Bay Protection and Toxic Cleanup Program Data

The Bay Protection and Toxic Cleanup Program (BPTCP) is an outgrowth of the TSM and SMW monitoring programs. Based on the results of the SMW and TSM data, Regional Board staff identified potential toxic hot spots where the data shows evidence of bioaccumulation that may pose a threat to beneficial uses. These areas were targeted for further investigation. As part of the BPTCP, the State Water Resources Control Board, together with the National Oceanic and Atmospheric Administration (NOAA), the Regional Board, the California Department of Fish and Game, the University of California at Santa Cruz, and San Jose State University Moss Landing Marine Laboratories, conducted a study, and published a report entitled "Sediment Chemistry, Toxicity, and Benthic Conditions in Selected Water Bodies of the Santa Ana Region, August 1998." (SWRCB, August 1998) This study provides monitoring data from throughout Newport Bay on:

1. Concentrations of toxic substances found in sediment samples collected throughout the Bay.

2. Concentrations of toxic substances found in the pore water of the sediment samples.

3. Concentrations of toxic substances found in fish tissue, from fish collected from the Rhine Channel area.

4. Toxicity to aquatic life in the sediment and the pore water of the sediment.

5. The relative benthic index, based on the abundance and diversity of benthic organisms living in the sediment.

Section 4.4.1 Sediment Chemistry

Figure 5 below, shows the locations of sample stations throughout Newport Bay that were used in the BPTCP study. These sample locations provide a general overview of sediment quality throughout Newport Bay. Sediment samples were collected from each of these stations, and both the sediment and the pore water within the sediment sample were analyzed for toxic substances. The concentrations of toxic substances in the sediment were compared with the NOAA sediment screening values discussed in Section 3. As discussed above these values are in the form of an Effects Range Median (ERM), which is the median concentration of a toxic substance in sediment found to be toxic to aquatic life. The ERM is the level at which toxicity to aquatic life in the sediment may be present, depending on the type of aquatic life that lives in sediment. The ERM for all the toxic substances found in the sediment and pour water is then combined in a calculation to develop an ERM Quotient. The ERM Quotient is an overall measure of the concentrations of all toxic substances found in the sediment that is used to rank contaminated areas throughout the Bay.

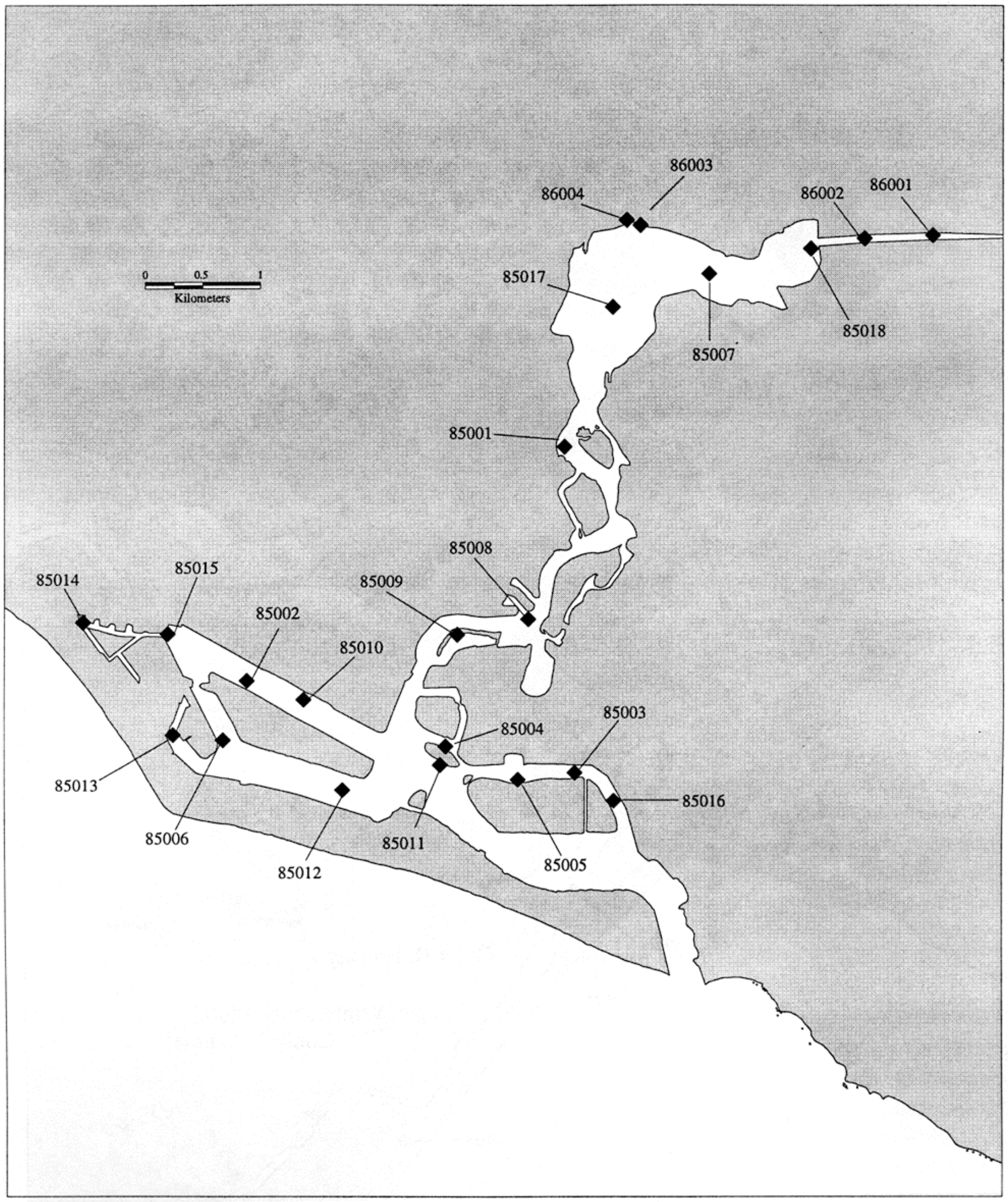

Figure 5: BPTCP Newport Bay Sampling Locations

Figure 6 below, shows the average ERM Quotient for the monitoring stations in Newport Bay used by the BPTCP. As shown in this figure, the Newport Island and the Rhine Channel areas had the highest levels of chemical contamination in the sediment. The Rhine Channel and Newport Island areas of the Bay are known to have poor tidal flushing, which may contribute to the higher contaminant levels. If the ERM Quotient is greater than 0.5, the sediment is considered elevated, and if the ERM Quotient is less than 0.1 the sediment is considered not likely to pose a threat to aquatic life. An ERM Quotient in between these numbers indicates an intermediate level of contamination of the sediment.

In addition to using the ERM Quotient to evaluate general sediment quality, the BPTCP report also evaluated the concentrations of the individual toxic substances in the sediment samples. These concentrations were compared to the ERM for each respective substance. Figure 7 shows that copper, mercury, zinc, and total PCB ERM values were exceeded in the Rhine Channel and Newport Island areas (and one location in the main channel of the Lower Bay), contributing to the high ERM quotients in those areas. Figure 8 shows the total chlordane concentrations from the sediment samples collected throughout the Bay. The data were also compared to the Threshold Effects Limit (TEL) and the Effects Range Limit (ERL), which are the lowest measured concentration shown to cause toxic effects to aquatic life. This figure shows that there are areas within the Bay with chlordane concentrations in the sediment that exceed the ERM, or are slightly below the ERM. Only two sites within the Bay show concentrations of chlordane below the ERL. Figure 9 below shows the concentrations of DDE found in sediment samples from throughout the Bay. DDE is a breakdown product of DDT. As shown in Figure 9 there are widespread relatively high concentrations of DDE found in sediment samples throughout the Bay. This is in stark contrast to the distribution of heavy metals and PCBs in sediment, as shown in Figure 7.

To provide some perspective on these data in comparison to other data collected by the BPTCP statewide, one of the conclusions reached by the study report authors is that the chemical contamination in Newport Bay was generally considered to be low in most areas and moderate in a few areas relative to other more highly industrialized areas.

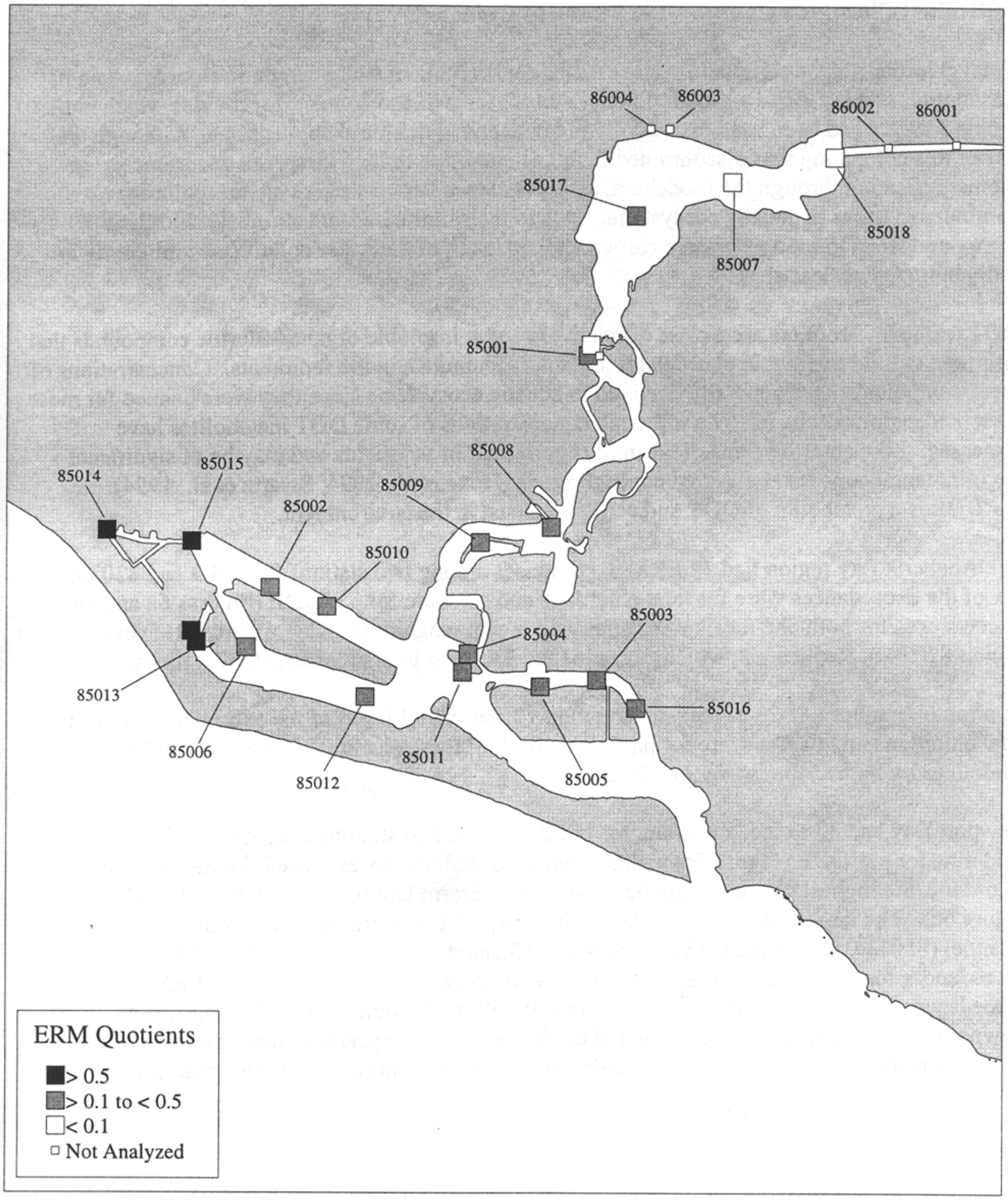

Figure 6: Average ERM Quotient for the monitoring stations in Newport Bay used by the BPTCP.

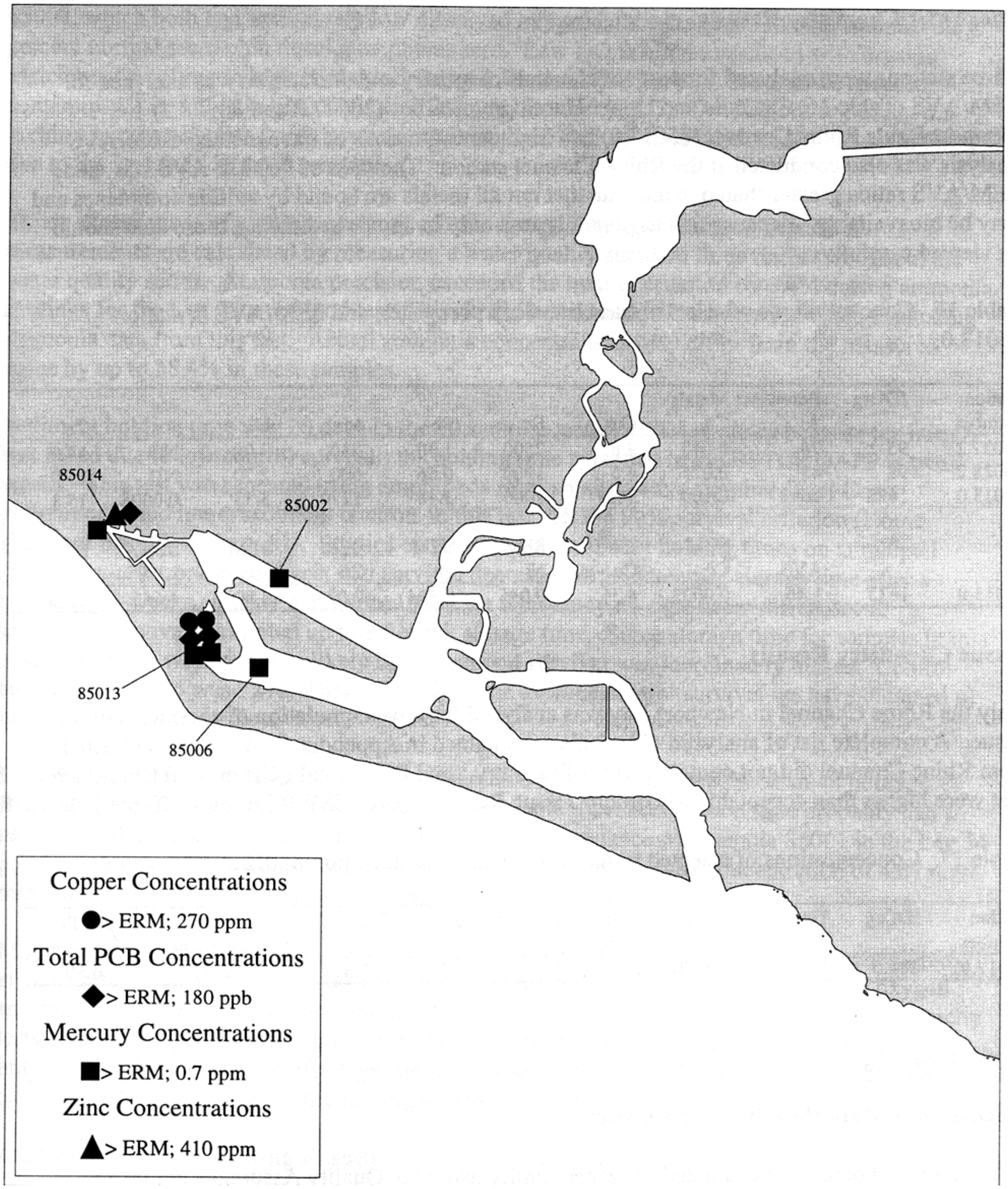

Figure 7: Copper, total PCB, Mercury, and Zinc Concentrations for Stations in Newport Bay

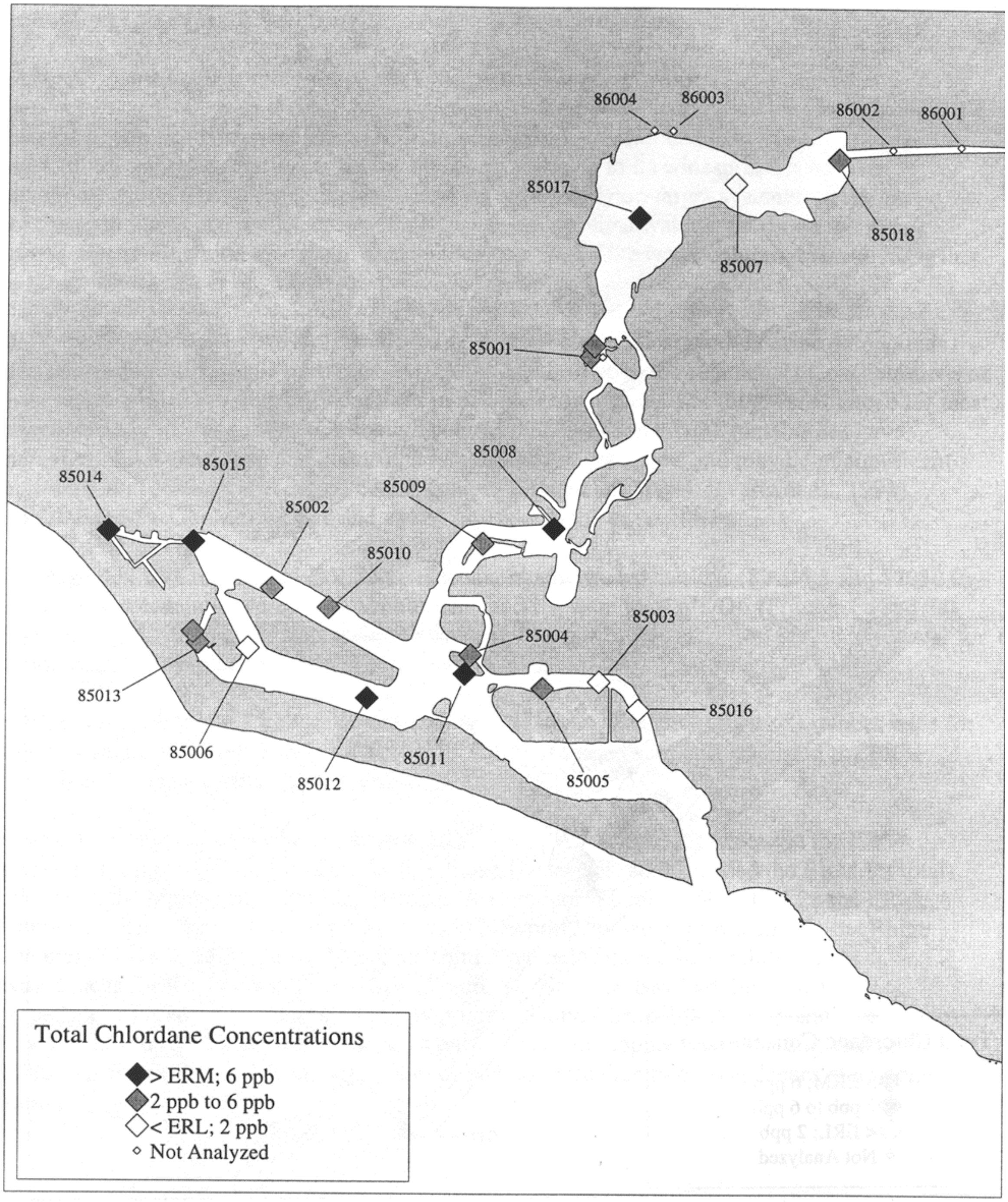

Figure 8: Total Chlordane Concentrations for Stations in Newport Bay

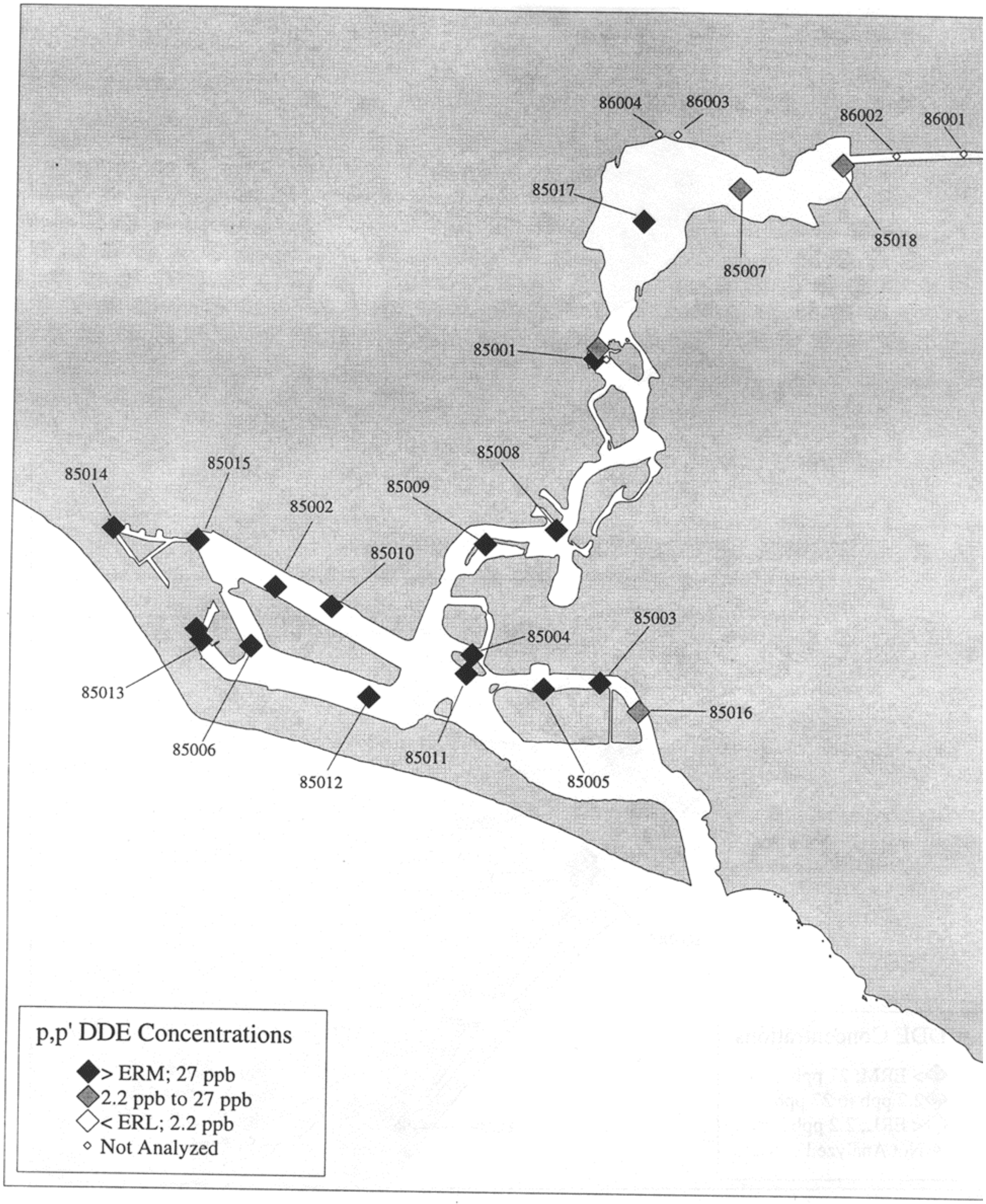

Figure 9: p,p' DDE Concentrations for Stations in Newport Bay

Section 4.4.2 Pore water chemistry

Results of analyses of sediment pore water samples collected throughout the Bay indicate that the Rhine Channel had high concentrations of copper, mercury, DDE, and PCB's, thereby having a potential to result in toxicity. The remaining stations showed evidence of elevated concentrations of chlordane and DDE.

Section 4.4.3 Fish Tissue Chemistry

The BPTCP monitoring program only collected samples of fish (topsmelt) tissue from the Rhine Channel area , for analysis for toxic substances . These data show that mercury , DDT , PCBs , chlordane and toxaphene are all below the MTRLs , the NAS guidelines and FDA action levels , and the OEHHA screening values.

Section 4.4.4 Sediment and Pore Water Toxicity

Sediment samples collected throughout the Bay were also subjected to toxicity testing using amphipods and purple sea urchin larvae, to determine if the chemicals that were found to exceed the ERMs were causing toxicity to aquatic life. As shown in Figure 10 and 11 below, toxicity to aquatic life in the sediment, and pore water, was mostly observed in the Rhine Channel and Newport Island areas, which were also the areas with the highest ERMQ values. Toxicity was also observed on the north and south sides of Lido Island and at two locations in the Upper Bay.

Section 4.4.5 Relative Benthic Index

Finally, the BPTCP collected samples of benthic organisms at each of the stations. Both the total number and types of benthic organisms were quantified, and used to calculate their Relative Benthic Index (RBI). Figure 12 below shows the results of this Benthic Index survey. As shown, most of the sites throughout the Bay are considered either degraded or transitional. It is noteworthy that the Rhine Channel and Newport Island areas, with the highest ERM Quotients, were classified as transitional, suggesting that factors other than toxic substance concentrations, for example, dredging, have an effect on the benthic community. The BPTCP did evaluate the effects of ammonia and dissolved sulfides in the sediment, and these chemicals did not correlate with the sediment and pore water toxicity.

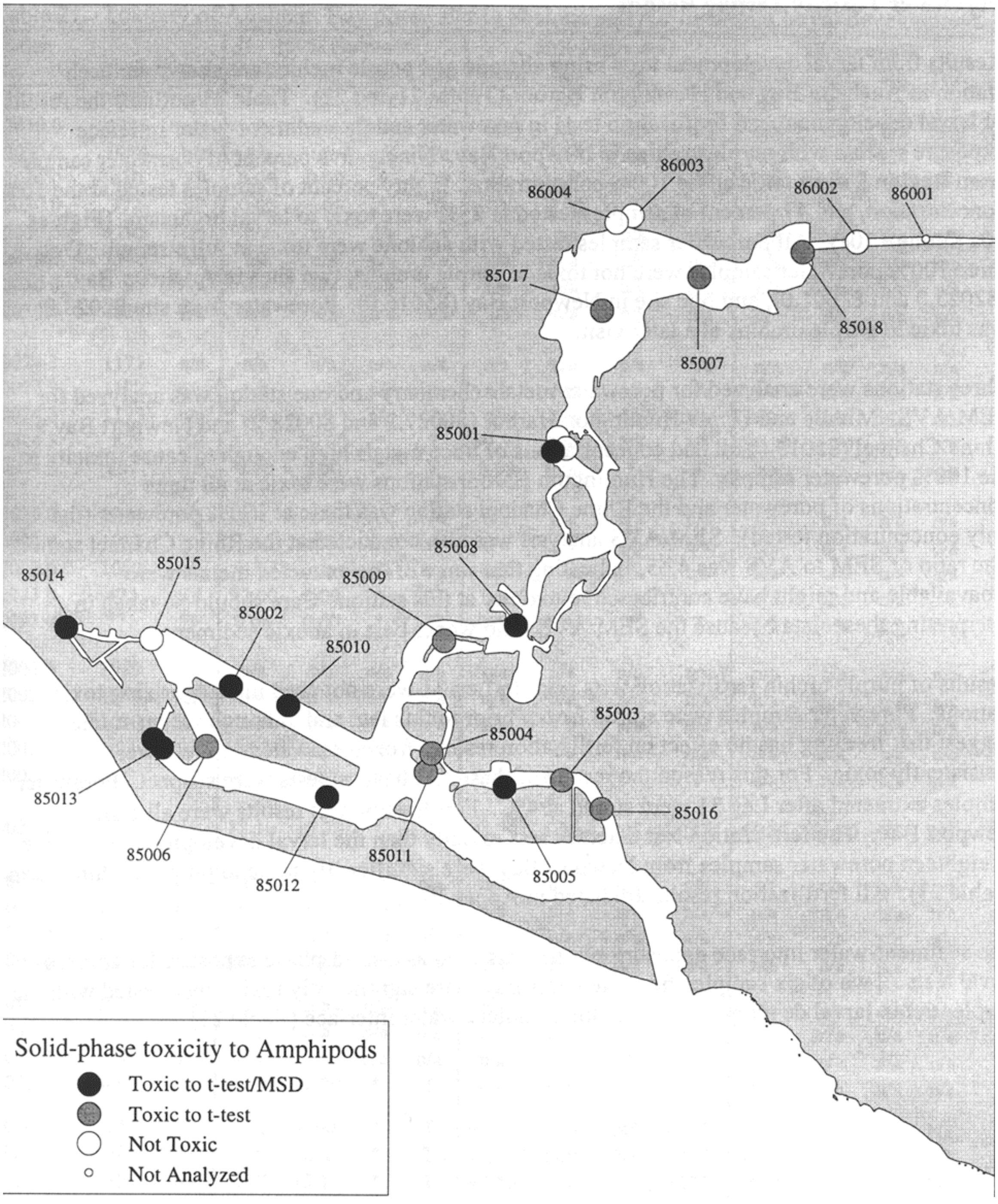

Figure 10: Solid Phase Toxicity to Amphipods in Newport Bay

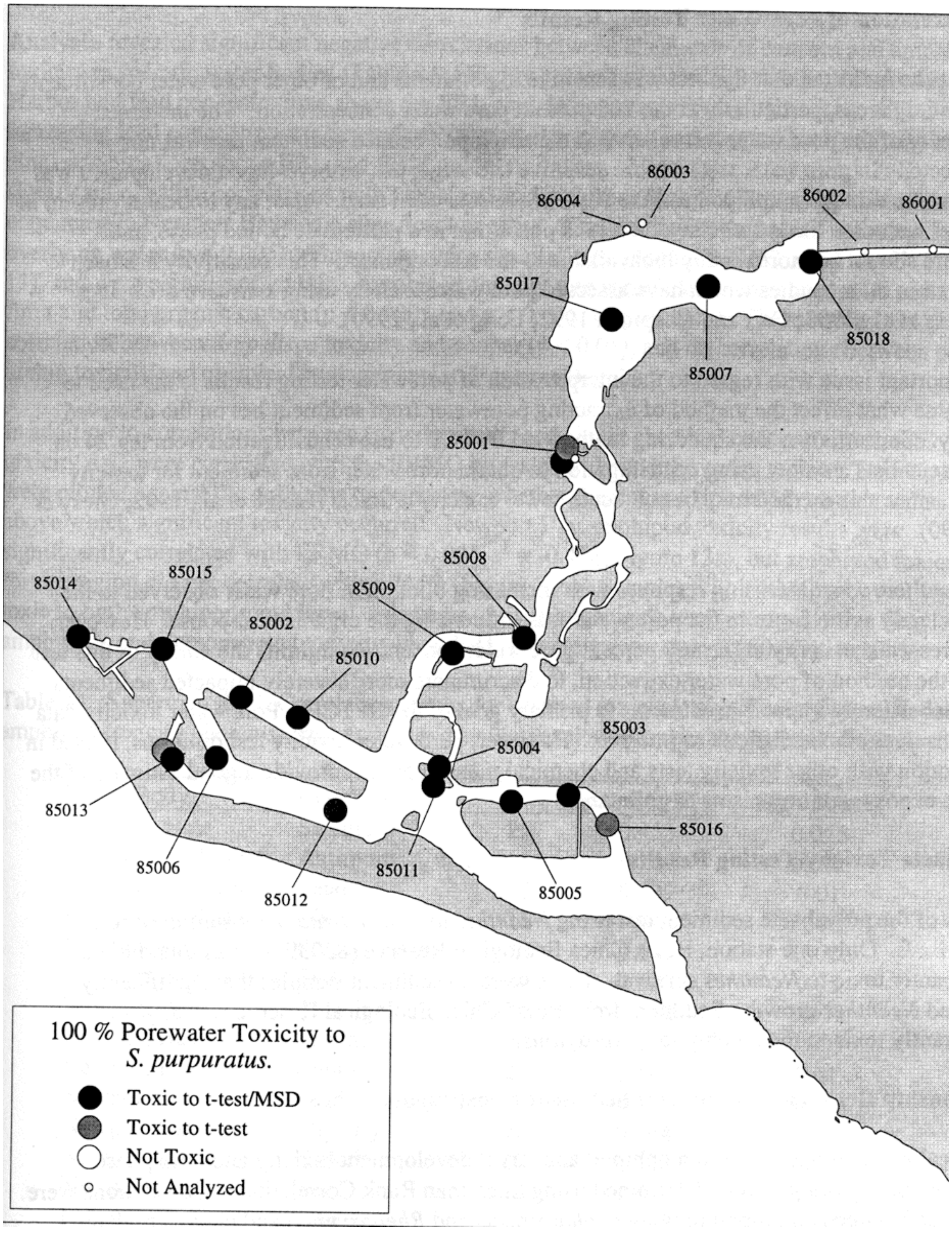

Figure 11: Porewater Toxicity to Larval Development in Newport Bay

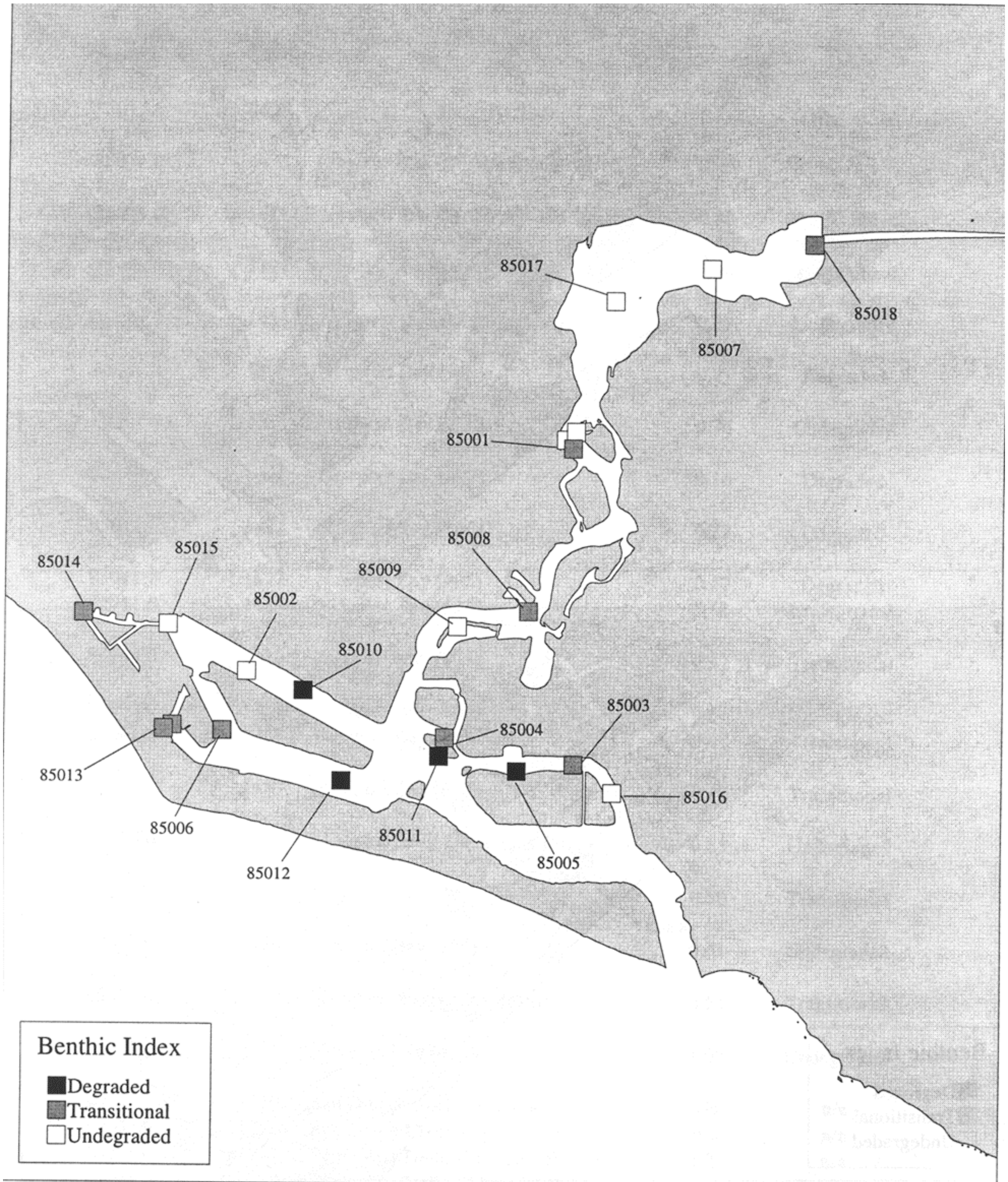

Figure 12: Benthic Index for Stations in Newport Bay

Section 4.4.6 Correlations Among Sediment Chemistry, Toxicity, and Benthic Index Data

The study report describes the results of statistical analyses of the data conducted to evaluate possible relationships among the chemistry, toxicity, and benthic data. Briefly, the authors found a statistically significant relationship between the benthic index and toxicity (to amphipods). These two biological indicators have significant relationships with several metals, chlordane, PCB's and DDT metabolites. Lead, mercury, copper, chromium, nickel, chlordane, and PCB's were correlated with toxicity; copper, chromium, nickel, and DDT metabolites were correlated with reduced benthic index.

Section 4.5 Irvine Ranch Water District Data

On December 18, 1997, April 16, 1998, and October 27, 1998, Irvine Ranch Water District (IRWD) collected samples of San Diego Creek at Campus Drive and Michelson Drive, and analyzed the samples for priority toxic pollutants. Table 15 below lists the monitoring data and summary statistics for dissolved heavy metal concentrations found in San Diego Creek at Campus Drive. (IRWD, WWSP Data Base, 1999) The data collected in San Diego Creek at Michelson Drive showed similar results. Concentrations are in parts per billion (ppb). These data show that concentrations of dissolved selenium exceed the CCC of 5 ppb, in all the samples analyzed. The concentrations of dissolved chromium also occasionally exceeded the acute water quality criterion of 11 ppb (based on a hardness of 400 mg/L).

Table 16 below lists all the organic chemicals that were not detected in San Diego Creek during all three sampling events. The detection limits employed are also shown. These data show that water column monitoring is not sufficient, in itself, to evaluate the impact of the discharges of toxic substances. When compared to the SMW and TSMP tissue concentrations discussed above it can be clearly seen that many toxic substances are not detected in water column monitoring, but are shown to be bioaccumulating in aquatic resources in the Bay. For example, DDT, PCBs, and many pesticides were not detected in the water column by this IRWD monitoring, but are shown by the SMW and TSMP data to be bioaccumulating. This shows that some toxic substances are being discharged at levels below the lowest detection level for methods used to analyze for toxic pollutants in the water column, but are bioaccumulating to levels in fish and mussel tissue that may pose a threat to organisms or public health.

Table 17 below summarizes IRWD’s monitoring data for the three monitoring events, for those toxic substances that were detected. Only four chemicals, carbon disulfide, di(2-ethylhexyl)phthalate, Phenolic compounds, tetrachloroethylene, and trichloroethylene, were detected occasionally, and therefore the data do not indicate these chemicals to be a problem. However, the data are not adequate to determine compliance with the CMC and CCC of the California Toxics Rule objectives cited in Section 2. The detection limits for those chemicals that were not detected may also exceed the CTR objectives in some cases so it is impossible to determine compliance.

Table 15: San Diego Creek at Campus Drive, Concentrations of Dissolved Heavy Metals (IRWD, WWSP 1997-99)

Date	Arsenic	Cadmium	Chromium	Copper	Lead	Selenium	Zinc	Mercury
	ppb	Ppb	Ppb	ppb	ppb	ppb	ppb	ppb
CTR Objective	150	7.3	11	30	39	5	387	0.77
12/18/97	4.7	0.3	0.85	29.7	3.25	27.8	14.7	<0.2
1/27/98	0.5	0.23	0.22	12	0.4	22.3	9.61	<.20
2/19/98	6	0.27	8.5	13.7	ND	36.9	3.52	<.20
3/10/98	5.69	0.44	16.2	22	ND	65	4.23	<.20
4/16/98	5.78	0.48	10	21.9	ND	64.6	4.5	<.20
5/21/98	3.88	0.6	4.76	25.8	3.1	23.7	14	0.011
6/16/98	5.48	0.24	3.09	18.5	2.04	38.1	15.3	0.018
7/7/98	5.54	0.34	4.62	28	1.7	40.5	16.7	0.02
8/12/98	10.3	0.363	1.16	4.96	0.58	33.8	12	0.024
9/1/98	4.86	0.258	0.701	15.7	0.24	30.7	3.71	0
10/27/98	9.7	0.172	12	5.12	0.06	43.7	3.81	0
11/18/98	6.91	0.265	9.67	3.15	0.07	49.6	5.58	0.01
12/15/98	5.62	0.322	3.48	2.24	0.03	36.9	19.2	0
1/7/99	5.45	0.203	1.24	2.19	0	37	11.8	0.049
2/23/99	6.15	0.152	5.72	2.44	0.01	42.6	23	0.017
3/30/99	8.53	0.214	14.7	2.55	0.06	52.9	4.98	
Average	5.94	0.30	6.06	13.12	0.89	40.38	10.42	0.01
Maximum	10.30	0.60	16.20	29.70	3.25	65.00	23.00	0.05
Minimum	0.50	0.15	0.22	2.19	0.00	22.30	3.52	0.00
No. of Samples	16.00	16.00	16.00	16.00	13.00	16.00	16.00	10.00
% Samples above CTR	0	0	6	0	0	100	0	0

Table 16: ORGANIC CHEMICALS NOT DETECTED BY IRWD MONITORING

Toxic Substance	MDL	Unit	Toxic Substance	MDL	Unit	Toxic Substance	MDL	Unit
1,1,1-Trichloroethane	0.5	Ug/l	Benzo(a)pyrene		ug/l	Isophorone		ug/l
1,1,2,2-Tetrachloroethane	0.5	Ug/l	Benzo(b)fluoranthene		ug/l	M,p-Xylenes	0.5	ug/l
1,1,2-Trichloroethane (1,1,2-T}	0.5	Ug/l	Benzo(g,h,i)perylene		ug/l	m-Dichlorobenzene (1,3-DCB)	0.5	ug/l
1,1-Dichloroethane	0.5	Ug/l	Benzo(k)fluoranthene		ug/l	Methoxychlor		ug/l
1,1-Dichloroethylene (1,1DCE)	0.5	Ug/l	Benzoic Acid		ug/l	Methyl Bromide	1	ug/l
1,2,4-Trichlorobenzene		Ug/l	Benzyl Alcohol		ug/l	Methyl Chloride	1	ug/l
1,2-Dichloroethane	0.5	Ug/l	Beta-BHC		ug/l	Methylene Chloride	3	ug/l
1,2-Dichloropropane	0.5	Ug/l	bis(2-Chloroethoxy)methane		ug/l	Naphthalene		ug/l
1,2-Diphenylhydrazine		Ug/l	bis(2-Chloroethyl)ether		ug/l	Nitrobenzene		ug/l
2,4,5-Trichlorophenol		Ug/l	bis(2-Chloroisopropyl)ether		ug/l	N-Nitrosodimethylamine		ug/l
2,4,6-Trichlorophenol		Ug/l	Bromoform	0.5	ug/l	N-Nitrosodi-N-propylamine		ug/l
2,4-Dichlorophenol		Ug/l	Butylbenzylphthalate		ug/l	N-Nitrosodiphenylamine		ug/l
2,4-Dimethylphenol	5	Ug/l	Carbon Tetrachloride	0.5	ug/l	o-Dichlorobenzene (1,2-DCB)		ug/l
2,4-Dinitrophenol		Ug/l	Chlordane		ug/l	o-Xylene	0.5	ug/l
2,4-Dinitrotoluene		Ug/l	Chlorobenzene	0.5	ug/l	P,p' DDD		ug/l
2,6-Dinitrotoluene		Ug/l	Chloroethane	0.5	ug/l	P,p' DDE		ug/l
2-Butanone (MEK)	10	Ug/l	Chloroform (Trichloromethane)	0.5	ug/l	P,p' DDT		ug/l
2-Chloroethylvinylether	0.5	Ug/l	Chrysene		ug/l	PCB 1016 Aroclor		ug/l
2-Chloronaphthalene		Ug/l	cis-1,2-Dichloroethene	0.5	ug/l	PCB 1221 Aroclor		ug/l
2-Chlorophenol		Ug/l	cis-1,3-Dichloropropene	0.5	ug/l	PCB 1232 Aroclor		ug/l
2-Hexanone	10	Ug/l	Delta-BHC		ug/l	PCB 1242 Aroclor		ug/l
2-Methylnaphthalene		Ug/l	Dibenzo(a,h)anthracene		ug/l	PCB 1248 Aroclor		ug/l
2-Methylphenol		Ug/l	Dibenzofuran		ug/l	PCB 1254 Aroclor		ug/l
2-Nitroaniline		Ug/l	Dibromochloromethane	0.5	ug/l	PCB 1260 Aroclor		ug/l
2-Nitrophenol		Ug/l	Dichlorobromomethane	0.5	ug/l	p-Chloro-m-cresol		ug/l
3,3'-Dichlorobenzidine		Ug/l	Dichlorodifluoromethane	0.5	ug/l	p-Dichlorobenzene (1,4-DCB)		ug/l
3-Nitroaniline		Ug/l	Dieldrin		ug/l	p-Dichlorobenzene (1,4-DCB)	0.5	ug/l
4,6-Dinitro-o-cresol		Ug/l	Diethylphthalate		ug/l	Pentachlorophenol		ug/l

Table 16: ORGANIC CHEMICALS NOT DETECTED BY IRWD MONITORING

Toxic Substance	MDL	Unit	Toxic Substance	MDL	Unit	Toxic Substance	MDL	Unit
4-Bromophenylphenylether		Ug/l	Dimethylphthalate		ug/l	Phenanthrene		ug/l
4-Chloroaniline		Ug/l	Di-n-butylphthalate		ug/l	Phenol		ug/l
4-Chlorophenylphenylether		Ug/l	Di-n-octylphthalate		ug/l	Pyrene		ug/l
4-Methyl-2-Pentanone (MIBK)	10	Ug/l	Endosulfan I (alpha)		ug/l	Styrene	0.5	ug/l
4-Methylphenol		Ug/l	Endosulfan II (beta)		ug/l	Tetrahydrofuran	10	ug/l
4-Nitroaniline		Ug/l	Endosulfan sulfate		ug/l	Toluene	0.5	ug/l
4-Nitrophenol		Ug/l	Endrin		ug/l	Total Cyanide	0.025	mg/l
Acenaphthene		Ug/l	Endrin Aldehyde		ug/l	Toxaphene		ug/l
Acenephthylene		Ug/l	Ethyl benzene	0.5	ug/l	Trans-1,2-Dichloroethene	0.5	ug/l
Acetone	10	Ug/l	Fluoranthene		ug/l	Trans-1,3-Dichloropropene	0.5	ug/l
Acrolein	200	Ug/l	Fluorene		ug/l	Trichlorofluoromethane	0.5	ug/l
Acrylonitrile	50	Ug/l	Gamma-BHC		ug/l	Vinyl Acetate	10	ug/l
Aldrin		Ug/l	Heptachlor		ug/l	Vinyl Chloride (VC)	0.5	ug/l
Alpha-BHC		Ug/l	Heptachlor Epoxide		ug/l			
Aniline		Ug/l	Hexachlorobenzene		ug/l			
Anthracene		Ug/l	Hexachlorobutadiene		ug/l			
Benzene	0.5	Ug/l	Hexachlorocyclopentadiene		ug/l			
Benzidine		Ug/l	Hexachloroethane		ug/l			
Benzo(a)anthracene		Ug/l	Indeno(1,2,3-c,d)pyrene		ug/l			

Table 17: Organic Chemicals Detected by IRWD Monitoring

ANALYTE	DESCR	LOCCODE	DATE	RESULT	MDL	RSLT	UNIT
Carbon disulfide	SDCCB	B	12/18/97	Not detected	0.5	Not detected	ug/l
Carbon disulfide	SDCCB	B	4/16/98	Not detected	0.5	Not detected	ug/l
Carbon disulfide	SDCCB	B	10/27/98	0.9	0.5	0.9	ug/l
Di(2-Ethylhexyl)phthalate	SDCCB	B	12/18/97	Not detected		Not detected	ug/l
Di(2-Ethylhexyl)phthalate	SDCCB	B	4/16/98	47	4	47	ug/l
Di(2-Ethylhexyl)phthalate	SDCCB	B	10/27/98	Not detected	4	Not detected	ug/l
Phenolic Compounds	SDCCB	B	12/18/97	Not detected	0.01	Not detected	mg/l
Phenolic Compounds	SDCCB	B	4/16/98	<0.010	0.01	<0.010	mg/l
Phenolic Compounds	SDCCB	B	10/27/98	0.011	0.01	0.011	mg/l
Tetrachloroethylene (PCE)	SDCCB	B	12/18/97	0.6	0.5	0.6	ug/l
Tetrachloroethylene (PCE)	SDCCB	B	4/16/98	Not detected	0.5	Not detected	ug/l
Tetrachloroethylene (PCE)	SDCCB	B	10/27/98	Not detected	0.5	Not detected	ug/l
Trichloroethylene (TCE)	SDCCB	B	12/18/97	0.5	0.5	0.5	ug/l
Trichloroethylene (TCE)	SDCCB	B	4/16/98	Not detected	0.5	Not detected	ug/l
Trichloroethylene (TCE)	SDCCB	B	10/27/98	Not detected	0.5	Not detected	ug/l

On two occasions, IRWD also collected water samples from 7 locations throughout Newport Bay, and analyzed the samples for dissolved heavy metals and toxic organic substances. These data showed the organic chemicals were, for the most part, not detected and the concentrations of dissolved metals were well below the CTR objectives, at all 7 locations in the Bay. (These data are included in Appendix 7)

Section 4.6 Orange County Stormwater NPDES Permit Monitoring Data

The County of Orange Public Facilities and Resources Department (OCPFRD) acts as lead agency for the agencies implementing the NPDES permit for urban stormwater runoff in the watershed, which includes requirements for monitoring. Stormwater runoff monitoring by OCPFRD has shown (Table 18) that San Diego Creek at Campus Drive has concentrations of dissolved cadmium, chromium, copper, lead and zinc that are less than the CTR water quality objectives for these substances, with sporadic exceptions in the case of copper and lead. Since the dissolved metal concentrations are below the CTR criteria these chemicals are probably not contributing to acute or chronic effects on aquatic life.

The data summarized in Table 18 below were collected by OCPFRD at San Diego Creek at Campus Drive from January 1997 to April 1999. (OCPFRD, ROWD, October, 2000) The data are mostly from storm events and for dissolved metal concentrations. There has been monitoring conducted at a frequency necessary to determine compliance with the instantaneous maximum CMC objective and the 4 day average CCC objective in the CTR for those metals that are monitored. However, it should be noted that the 4-day average calculation is for each sequential 4 sample days, whether the days are consecutive or not. These 4-day values are therefore 4-sample days, but still provide a 4-day average to compare with the CCC criteria. The OCPFRD stormwater monitoring data show that concentrations of dissolved cadmium, chromium, lead and zinc in San Diego Creek at Campus Drive have not exceeded the CTR CMCs and CCCs, between January 1997 and April 1999. The data do show sporadic violations of the CTR objectives for copper.

OCPFRD has also periodically collected water samples from 5 locations throughout Newport Bay, and analyzed the samples for dissolved heavy metals and toxic organic substances. (All OCPFRD Stormwater Monitoring Data are included in Appendix 8) Table 19, below, summarizes the OCPFRD stormwater monitoring for Newport Bay. These data show that concentrations of dissolved copper exceed the acute and chronic CTR water quality objectives at all stations throughout the Bay. The data also show that the concentrations of cadmium, chromium, lead, nickel, silver and zinc do not exceed the CTR water quality objectives at any of the Newport Bay monitoring stations.

Table 18: Summary of OCPFRD Stormwater NPDES Permit Monitoring, San Diego Creek at Campus Drive (OCPFRD, 1991-1998) (CMC values are in ppb of dissolved metals and CCC values are the 4-day average concentrations in ppb.)

DATE	Cd	Cd-4	Cr	Cr-4	Cu	Cu-4	Pb	Pb-4	Ni	Ni-4	Ag	Ag-4	Zn	Zn-4
	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
CTR Objective at	19.1	6.2	16.0	11.0	50.0	29.0	281.0	10.9	1513.0	168.0	37.4		379.0	382.0
400 mg/L Hardness														
4/7/99	1.0	1.0	8.0	8.0	17.6	14.6	2.0	2.0	6.8	4.8	2.0	2.0	14.0	12.8
Average	1.4	1.4	8.9	9.4	15.5	15.7	3.3	3.7	6.0	7.8	1.4	1.4	36.3	38.3
Maximum	10.0	5.3	75.0	37.8	100.0	54.5	70.0	36.5	73.0	73.0	2.0	2.0	320.0	184.0
Mimimum	0.5	0.5	0.5	0.5	4.9	9.0	1.0	1.0	1.4	2.7	0.5	0.5	5.2	7.6
No. of Samples	66	69	68	69	69	69	69	69	67	68	68	69	69	69
% of Samples	0.0	0.0	0.0	0.0	1.5	5.8	0.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0
Above Objectives														

Table 19: Summary of OCPFRD Stormwater NPDES Permit Monitoring, Newport Bay (OCPFRD, 1991-1998) (CMC values are in ppb of dissolved metals and CCC values are the 4-day average concentrations in ppb.)

		CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC
STATION	**DATE**	**Cd**	**Cd-4**	**Cr**	**Cr-4**	**Cu**	**Cu-4**	**Pb**	**Pb-4**	**Ni**	**Ni-4**	**Ag**	**Ag-4**	**Zn**	**Zn-4**
		ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
CTR-Objective		42.00	9.30	1100.0	50.00	4.80	3.10	210.00	8.10	74.00	8.20	1.90	1.90	90.00	81.00
UNBJAM	4/16/99	1.00	1.40	8.00	8.00	13.30	8.59	2.00	2.00	6.71	7.79	2.00	2.00	10.10	15.90
Average		1.12	1.12	7.69	7.45	8.00	7.90	2.00	2.00	5.39	5.17	1.69	1.75	20.85	19.30
No. of Samples		13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00
% above Objective		0.00	0.00	0.00	0.00	84.62	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNBSDC	4/16/99	1.00	1.00	8.00	8.00	12.60	8.65	2.00	2.00	6.98	7.57	2.00	2.00	11.80	10.45
Average		1.00	1.00	8.00	7.83	7.25	6.95	2.00	2.00	5.45	5.14	1.75	1.83	15.12	14.95
No. of Samples		12.00	9.00	12.00	9.00	12.00	9.00	12.00	9.00	12.00	9.00	12.00	9.00	12.00	9.00
% above Objective		0.00	0.00	0.00	0.00	75.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNBBCW	4/16/99	1.00	1.16	8.00	8.00	13.80	9.79	2.00	2.00	6.79	7.84	2.00	2.00	10.00	12.25
Average		1.05	1.05	7.69	7.45	8.30	8.44	2.00	2.00	5.58	5.35	1.69	1.75	17.31	16.35
No. of Samples		13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00	13.00	10.00
% above Objective		0.00	0.00	0.00	0.00	84.62	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 19: Summary of OCPFRD Stormwater NPDES Permit Monitoring, Newport Bay (OCPFRD, 1991-1998) (CMC values are in ppb of dissolved metals and CCC values are the 4-day average concentrations in ppb.)

		CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC
STATION	**DATE**	**Cd**	**Cd-4**	**Cr**	**Cr-4**	**Cu**	**Cu-4**	**Pb**	**Pb-4**	**Ni**	**Ni-4**	**Ag**	**Ag-4**	**Zn**	**Zn-4**
		ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
CTR-Objective		42.00	9.30	1100.0	50.00	4.80	3.10	210.00	8.10	74.00	8.20	1.90	1.90	90.00	81.00
UNBNSB	4/16/99	1.00	1.00	8.00	8.00	15.30	10.76	2.00	2.00	7.14	6.25	2.00	2.00	10.00	11.40
Average		2.53	2.73	12.00	12.13	34.16	39.91	4.40	4.63	5.81	5.85	2.80	2.94	26.67	27.20
No. of Samples		15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00
% above Objective		0.00	0.00	0.00	0.00	80.00	100.00	0.00	0.00	0.00	8.33	0.00	0.00	13.33	0.00
UNBNDB	4/16/99	1.00	1.00	8.00	8.00	15.30	10.75	2.00	2.00	7.24	8.10	2.00	2.00	13.60	16.43
Average		2.34	2.49	12.00	12.13	10.61	11.06	4.51	4.66	6.23	6.06	2.80	2.94	27.49	28.85
No. of Samples		15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00	15.00	12.00
% above Objective		0.00	0.00	0.00	0.00	80.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	0.00
UNBCHB	4/16/99	1.00	1.00	8.00	8.00	16.10	10.59	2.00	2.00	7.34	9.14	2.00	2.00	10.10	10.28
Average		2.38	2.56	12.29	12.50	12.03	12.71	4.57	4.86	6.82	6.74	2.86	3.02	25.04	26.25
No. of Samples		14.00	11.00	14.00	11.00	14.00	11.00	14.00	11.00	14.00	11.00	14.00	11.00	14.00	11.00
% above Objective		0.00	0.00	0.00	0.00	85.71	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 19: Summary of OCPFRD Stormwater NPDES Permit Monitoring, Newport Bay (OCPFRD, 1991-1998) (CMC values are in ppb of dissolved metals and CCC values are the 4-day average concentrations in ppb.)

		CMC	**CCC**	**CMC**	**CCC**	**CMC**	**CCC**	**CMC**	**CCC**	**CMC**	**CCC**	**CMC**	**CCC**	**CMC**	**CCC**
STATION	**DATE**	**Cd**	**Cd-4**	**Cr**	**Cr-4**	**Cu**	**Cu-4**	**Pb**	**Pb-4**	**Ni**	**Ni-4**	**Ag**	**Ag-4**	**Zn**	**Zn-4**
		ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
CTR-Objective		42.00	9.30	1100.0	50.00	4.80	3.10	210.00	8.10	74.00	8.20	1.90	1.90	90.00	81.00
LNBHIR	4/16/99	1.00	1.00	8.00	8.00	16.70	11.43	2.00	2.00	4.00	8.39	2.00	2.00	10.00	11.03
Average		1.00	1.00	8.00	8.00	11.58	10.43	2.00	2.00	6.71	7.33	2.00	2.00	12.74	12.42
No. of Samples		7.00	4.00	7.00	4.00	7.00	4.00	7.00	4.00	7.00	4.00	7.00	4.00	7.00	4.00
% above Objective		0.00	0.00	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LNBRIN	4/16/99	1.00	1.00	8.00	8.00	19.60	15.83	2.00	2.00	7.42	9.93	2.00	2.00	14.30	21.20
Average		1.11	1.12	8.00	8.00	15.66	15.30	2.00	2.00	6.74	6.78	2.00	2.00	20.16	22.92
No. of Samples		9.00	6.00	9.00	6.00	9.00	6.00	9.00	6.00	9.00	6.00	9.00	6.00	9.00	6.00
% above Objective		0.00	0.00	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LNBTUB	4/16/99	1.00	1.00	8.00	8.00	11.30	11.55	2.00	2.00	4.00	8.60	2.00	2.00	10.00	16.68
Average		1.00	1.00	8.00	8.00	11.42	11.50	2.00	2.00	8.29	8.98	2.00	2.00	18.68	18.76
No. of Samples		5.00	2.00	5.00	2.00	5.00	2.00	5.00	2.00	5.00	2.00	5.00	2.00	5.00	2.00
% above Objective		0.00	0.00	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Section 4.7 Orange County CWA Section 319 Contract Monitoring Data

In 1993 the Regional Board commissioned the "Newport Bay Watershed Toxicity Study" (Baily, H.C. et al, UC Davis February 1993) (Appendix 9). This study collected samples of San Diego Creek at Campus Drive and Culver Drive, and Peters Canyon Wash at Barranca Parkway, and analyzed the samples for acute and chronic toxicity to fathead minnows, *Ceriodaphnia dubia*, and *Selenastrum* algae. The study also included a toxicity identification evaluation (TIE) to identify the causes of the toxicity that was found. This study found that none of the three samples showed significant effects on mortality or growth of the fathead minnows, but found 100% mortality to *Ceriodaphnia* at all three locations. There was no inhibition to algae growth in any of the samples. The TIE portion of the study indicated that heavy metals were probably not causing the toxicity and that pesticides probably were causing at least some of the toxicity.

This study was followed by an intensive investigation of the causes and sources of the acute toxicity found in San Diego Creek. This investigation, which is being completed by the OCPFRD, with G. Fred Lee and Scott Taylor, RBF, is in the final phase before the final report is to be submitted to the Regional Board, in accordance with the terms of the contract that provided funding for a portion of the work under Section 319 of the Clean Water Act. (RBF, Lee and Taylor, September 17, 1997)

Briefly, beginning in October 1996, ten locations were sampled for toxicity testing and TIE studies, including San Diego Creek at Campus Drive. Sampling was conducted during both wet and dry weather. Table 20 below provides a summary of the concentrations of diazinon and chlorpyrifos and the levels of acute toxicity to *Ceriodaphnia* found in San Diego Creek at Campus Drive.

As shown, complete mortality in the 4 to 7 day test usually occurred during the first day of the test. Concentrations of diazinon and chlorpyrifos were also present at levels known to cause toxicity to *Ceriodaphnia* and other organisms, based on the risk assessment for these chemicals completed by the manufacturers and/or the California Department of Fish and Game Water Quality Criteria for Diazinon and Chlorpyrifos. (Fish and Game fresh water CMC and CCC for diazinon, are 0.08 ppb and 0.05 ppb, and their CMC and CCC for chlorpyrifos are 0.02 ppb and 0.014 ppb.) TIE studies conducted on the samples show that organophosphate pesticides, diazinon and chlorpyrifos, are causing approximately 50% of the measured toxicity. The study has not been able to conclusively identify the cause of the remaining toxicity, but pyrethroid pesticides are suspected as a possible source. Up to 32 acute toxicity units were measured in the smaller tributaries (these results will be discussed as part of the source analysis).

In general, the toxicity and pesticide monitoring conducted under this contract shows that discharges of pesticides to Hines Channel from two nurseries are a significant source of toxicity and pesticides, and that the toxicity in Hines Channel persists downstream to San Diego Creek at Campus Drive. The toxicity testing also shows that there is toxicity to mysid shrimp (a marine organism), which may indicate a threat to the aquatic life beneficial uses of Newport Bay.

Table 20: Summary of Acute Toxicity and Pesticide Monitoring in San Diego Creek at Campus Drive (OCPFRD, G. Fred Lee and Scott Taylor, RBF, November 1998)

Date	Station	Diazinon	Chlorpyrifos	% Mortality	TUa	Estimated TUa
		Ppb	Ppb	(Days to 100%)		(LC50 to Cerio)
10/30/96	SDC@Campus	0.370	0.157	100(1)	>8	3
11/19/96	SDC@Campus Base	0.164	ND	0	0	0.5
11/21/96	SDC@Campus	0.359	0.133	100(1)		2.5
9/25/97	SDC@Campus	0.155	0.106	100(3)		1.5
11/13/97	SDC@Campus	0.462	0.161	100(1)	4 to 8	3
11/30/97	SDC@Campus	0.226	0.063	100(1)	3 to 4	1
11/30/97	SDC@Campus	0.278	0.090	100(2)		2
12/6/97	SDC@Campus	0.215	0.089	100(2)		1.5
12/6/97	SDC@Campus	0.257	0.057			1
12/6/97	SDC@Campus	0.197	<0.050			<1
12/6/97	SDC@Campus	0.195	0.082			1.5
3/24/98	SDC@Campus Base	0.148	ND	0		0.3
3/25/98	SDC@Campus	0.196	ND	100(4)		0.4
3/25/98	SDC@Campus	0.462	0.050			1.5
3/25/98	SDC@Campus	0.294	ND			0.5
3/26/98	SDC@Campus	0.250	ND			0.5
5/5/98	SDC@Campus	0.136	ND	100(2)		0.3
5/12/98	SDC@Campus	0.096	0.065	100(1)		0.8
5/12/98	SDC@Campus	0.375	0.057	100(1)		1.6
5/13/98	SDC@Campus	0.375	0.057			1.5
5/13/98	SDC@Campus	0.371	0.058			1.5
8/13/98	SDC@Campus Base	0.253	0.067	0		1.3
8/25/98	SDC@Campus Base	0.492	0.011	0		1.2
11/8/98	SDC@Campus	<0.050	0.500	100(1)		6
1/21/99	SDC@Campus Base	0.570	0.070	100(1)	2 to 4	2
1/25/99	SDC@Campus	0.960	<0.050	100(1)		2
1/25/99	SDC@Campus	0.910	<0.050	100(1)		2
1/26/99	SDC@Campus	0.880	<0.50	100(1)	4 to 8	2
1/27/99	SDC@Campus	0.640	0.048	100(1)	4 to 8	1.5

Blank Spaces = No Data

This evidence shows that stormwater and non-storm water runoff being discharged into San Diego Creek contains toxic substances that are highly toxic to aquatic life test organisms. *Ceriodaphnia* is indicative of similar species that live in San Diego Creek, and the mysids used in the toxicity tests are indicative of the marine organisms that live in Newport Bay. The results indicate that toxic substances, including diazinon and chlorpyrifos, are causing or threatening to cause adverse impacts to the biota of San Diego Creek, in violation of the Basin Plan narrative objective. Modeling is currently being conducted to determine the extent of impact within the Bay resulting from the discharge of various loads of toxic substances, as part of the development of this TMDL. Additional TIE studies need to be conducted to determine the other toxic substances causing toxicity in San Diego Creek at Campus Drive, from San Diego Creek and other tributaries.

Section 4.8 CA Department of Pesticide Regulations Monitoring Data

Table 21 below is a summary of monitoring of San Diego Creek conducted by the California Department of Pesticide Regulations (DPR). DPR conducted the monitoring to assess the impacts of the implementation of Red Imported Fire Ant (RIFA) control requirements by nurseries in the watershed. These requirements include the use of certain pesticides, including chlorpyrifos, to control the RIFA. These samples were collected during non-storm base flow conditions in the creek. This monitoring found acute toxicity to *Ceriodaphnia* in San Diego Creek and indicated that diazinon and chlorpyrifos may be the cause. These data confirm the OCPFRD/RWQCB study discussed above. The levels of toxicity and pesticides found by DPR show violations of the narrative objectives and other criteria. DPR also monitored for Fonofos, Methidathion, M. Parathion, Phosmet, Bifenthrin, Fenoxycarb, Hydramethylnon, and Pyriproxyfen, which were all not detected. (CDPR, RIFA Monitoring Reports, November 1999-May 2000)

Table 21: Summary of DPR RIFA Monitoring, San Diego Creek at Campus Drive

Date	Acute Toxicity	Acute Toxicity	Chlorpyrifos	Diazinon	Dimethoate	Bifenthrin	Malathion
	% Mortality	% Mortality	ppb	ppb	ppb	ppb	ppb
	(test/control)	(test/control)					
	c. dubia	n. mercedis					
Base							
5/21/99	0/0	25/20	ND	0.159	ND	ND	ND
6/25/99	0/0	30/15	ND	0.13	ND	ND	ND
9/23/99	30/0	50/45	ND	0.134	ND	ND	ND
10/26/99	100/5		0.58	0.16	0.451	ND	ND
12/9/99	100/0		0.124	0.189	0.092	ND	ND
1/17/00	100/0		0.079	0.128	ND	ND	ND
3/27/00	95/5		ND	0.168	ND	ND	ND
4/19/00	100/0		0.062	0.197	0.197	ND	0.071
Average			0.211	0.158	0.247	ND	0.071
Range			ND-0.58	0.128-0.197	0.092-0.451	ND	0.071
Rain							
1/25/00	100/0		0.121	0.591	ND	ND	0.35
1/25/00	100/0		ND	0.836	0.06	ND	0.188
1/25/00	100/5		0.108	0.566	ND	ND	0.395
1/25/00	100/5		0.081	0.542	ND	ND	0.533
1/25/00	100/5		0.163	0.498	ND	ND	1.47
1/25/00	100/10		0.206	0.537	ND	ND	0.251
2/23/00	100/10		0.101	0.135	0.138	ND	0.07
Average			0.130	0.529	0.099	ND	0.465
Range			ND-0.206	0.13-0.83	ND-0.138	ND	0.07-1.47

Table 21: Summary of DPR RIFA Monitoring, San Diego Creek at Campus Drive

	Methidathion	M. Parathion	Phosmet	Fonofos	Fenoxycarb	Hydramethylnon	Pyriproxyfen
	ppb	ppb	ppb	ppb	ppb	ppb	ppb
Base Flow							
5/21/99	ND	ND	ND	ND	ND	ND	ND
6/25/99	ND	ND	ND	ND	ND	ND	ND
9/23/99	ND	ND	ND	ND	ND	ND	ND
10/26/99	ND	ND	ND	ND	ND	ND	ND
12/9/99	ND	ND	ND	ND	ND	ND	ND
1/17/00	ND	ND	ND	ND	ND	ND	ND
3/27/00	ND	ND	ND	ND	ND	ND	ND
4/19/00	ND	ND	ND	0.073	ND	ND	ND
	Methidathion	**M. Parathion**	**Phosmet**	**Fonofos**	**Fenoxycarb**	**Hydramethylnon**	**Pyriproxyfen**
	ppb	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**
Rain							
1/25/00	ND	ND	ND	ND	ND	ND	ND
1/25/00	ND	ND	ND	ND	ND	ND	ND
1/25/00	ND	ND	ND	ND	ND	ND	ND
1/25/00	ND	ND	ND	ND	ND	ND	ND
1/25/00	ND	ND	ND	ND	ND	ND	ND
1/25/00	ND	ND	ND	ND	ND	ND	ND
2/23/00	ND	ND	ND	ND	ND	ND	ND

5.0 Conclusion

The Regional Board initially listed Newport Bay and San Diego Creek on the Clean Water Act Section 303(d) list, as water quality limited due to pesticides, heavy metals, priority organics, and unknown toxicity. Table 22 below provides a summary of the initial Section 303(d) list for Newport Bay and San Diego Creek.

Table 22: Summary of Section 303(d) List for Newport Bay and San Diego Creek (RWQCB, Santa Ana Region, March 16, 1998)

Water Body	Causes
Lower Newport Bay	Metals, Pesticides, Priority Organics
Upper Newport Bay	Metals, Pesticides
San Diego Creek, Reach 1	Metals, Pesticides
San Diego Creek, Reach 2	Metals, Unknown Toxicity

Based upon the review of existing monitoring evidence for these water bodies, as discussed in this report, refinement of the Section 303(d) list is necessary to identify those pollutants, and water bodies, for which TMDLs are required. As discussed above, a variety of different types of monitoring data have been evaluated to determine whether the Basin Plan narrative or numeric objectives are being violated, or threatened to be violated. This monitoring evidence includes monitoring for toxic substances in the water column, the sediment, and mussel and fish tissue, as well as water column and sediment toxicity monitoring. A survey of the abundance and diversity of benthic organisms was also reviewed.

Based on the refinements to the Section 303(d) list identified in Table 23, staff will proceed, with the USEPA, to develop TMDLs for each water body and group of toxic substances listed. Similar toxic substances have been grouped together to streamline the development of the TMDLs.

Board staff used a weight of evidence approach to evaluate these various types of monitoring data. A number of factors were considered to determine whether a particular toxic substance is causing or may be causing violations of the Basin Plan objectives and is therefore subject to TMDL development. These factors included:

- Whether concentrations of toxic substances in the water column exceed California Toxics Rule water quality objectives

- Whether concentrations of toxic substances in the water, sediment or biota exceed the applicable screening values

- The reliability and extent (geographically/temporally) of the data
- The consistency of the results and anomalies in the data
- The percentage of data showing exceedances of objectives and screening values, and
- The historic versus the most recent data

The results of this weight-of-evidence evaluation are reflected in Table 23. Table 23 provides a refinement to the initial Section 303(d) list for Newport Bay and San Diego Creek. This Table identifies the water body or portion thereof affected by the toxic substance(s), the toxic substance(s) that are or may be causing violations of water quality objectives, and whether TMDL development is required. The Table also summarizes the evidence used to make the evaluation. The "Water Column Toxicity" column reflects data on measured water column concentrations and Toxicity Identification Evaluations. The "Sediment Toxicity" and "Degraded Benthic Organisms" columns reflect data from the Bay Protection and Toxic Cleanup Program. The "Bioaccumulation" column is based on the State Mussel Watch and Toxics Substance Monitoring Programs and the 1999 OEHHA data on fish filets. The Bioaccumulation column is subdivided into "human health'' and "ecological effects" columns, indicating whether the bioaccumulation data may suggest a threat to human consumers or the biota. The notes following the Table provided a succinct review of the weight-of-evidence evaluation and factors considered in making recommendations concerning TMDL development for each of the water bodies.

Based on the refinements to the Section 303(d) list identified in Table 23, staff will proceed, with the USEPA, to develop TMDLs for each water body and group of toxic substances listed. Similar toxic substances have been grouped together to streamline the development of the TMDLs.

Table 23: Refined Section 303(d) List for Toxic Substances in Newport Bay and San Diego Creek

	Water Body	Pollutant-Toxic Substance	Water Column Toxicity	Sediment Toxicity	Degraded Benthic Organisms	Bioaccumulation Human Health	Ecology	TMDL Develop-ment
1	San Diego Creek-Reach 2	Diazinon, Chlorpyrifos	No Data	No Data	No Data	No Data	No SV	Yes, RWQCB
2	San Diego Creek-Reach 1	Diazinon, Chlorpyrifos	Yes	No Data	No Data	Maybe (diazinon)	No SV	Yes, RWQCB
3	San Diego Creek-Reach 1	PCBs, DDT, Toxaphene	No	No Data	No Data	Maybe	Maybe toxaphene	Yes, PCBs, DDT, toxaphene USEPA
4	San Diego Creek-Reach 1	Selenium	Exceeds CTR	No Data	No Data	No	No SV	Yes, RWQCB
5	Upper Newport Bay	Chlorpyrifos	Yes	No Data	No Data	No	No SV	Yes, RWQCB
6	Upper Newport Bay	Copper	Exceeds CTR	Maybe	Maybe	No	No SV	Yes, USEPA
7	Upper Newport Bay	Selenium	No Data	No Data	No Data	No	No SV	Yes, RWQCB
8	Upper Newport Bay	PCBs, DDT, Chlordane	No	Maybe PCBs, chlordane	Maybe DDT	No	No SV	Yes, PCBs, DDT USEPA
9	Upper Newport Bay-PCH Bridge	Arsenic	No Data	No Data	No Data	Maybe	No SV	Yes, USEPA
SV = Screening Value								

Table 23: Refined Section 303(d) List for Toxic Substances in Newport Bay and San Diego Creek

	Water Body	Pollutant-Toxic Substance	Water Column Toxicity	Sediment Toxicity	Degraded Benthic Organisms	Bioaccumulation Human Health	Ecology	TMDL Develop-ment
10	Upper Newport Bay	Arsenic	No	No	No	Maybe	No SV	Yes, USEPA
11	Lower Newport Bay-Rhine Channel	Arsenic, Chromium, Copper, Lead, Mercury, Zinc, DDT, PCBs	No Data	Maybe Cu, Cr, Hg, Pb, Zn, PCBs	Maybe Cu, Cr, DDT	Maybe As, Cr, Zn, DDT, PCBs	No Sv	Yes, USEPA
12	Lower Newport Bay	PCBs, DDT	No Data	Maybe (PCBs)	Maybe (DDT)	Maybe PCBs, DDT	No SV	Yes, USEPA
13	Lower Newport Bay	Selenium	No Data	No Data	No Data	No	No SV	Yes, RWQCB
14	Lower Newport Bay	Copper	Exceeds CTR	Maybe	Maybe	No	No SV	Yes, USEPA
15	San Diego Creek, Upper Newport Bay, Lower Newport Bay	Oxadiazon, carbaryl, malthion, bifenthrin, percent fines, unknown toxicity	Maybe	Maybe	Maybe	No SV	No SV	No, Further Investiga-tion

SV = Screening Value

Notes to Table 23:

1. San Diego Creek Reach 2: Evaluation of diazinon and chlorpyrifos necessary to complete TMDL for San Diego Creek Reach 1 and Upper Newport Bay (chlorpyrifos).

2. San Diego Creek Reach 1: Diazinon and chlorpyrifos are responsible, in part, for water column toxicity. (OCPFRD Section 319 monitoring, See Section 4.6)

3. San Diego Creek Reach 1: Historically, bioaccumulation of these legacy pesticides and PCBs were above the screening values. Recent data show concentrations declining to levels below screening values, with a few exceptions. The 1993 SMW data from San Diego Creek at MacArthur Bridge showed toxaphene, dieldrin, and PCB concentrations above OEHHA screening values. The TSM data collected between 1991 and 1995 from San Diego Creek and tributaries showed toxaphene concentrations above NAS Guidelines. A 1991 sample from El Modeno Channel showed DDT concentrations above the NAS Guideline (See Section 4.2) These chemicals are known to adsorb to sediment and soil particles. The sediment TMDL is expected to reduce the transport of soil and sediment, and therefore these pollutants. PCB and DDT concentrations from San Diego Creek will need to be considered in TMDLs for these constituents in Lower Newport Bay (See No. 12 below) Bioaccumulation of these constituents should continue to be investigated to confirm declining trends.

4. San Diego Creek Reach 1: Selenium exceeds the CTR objective (See IRWD Data, Section 4.4) TIE work in 1993 (Appendix 9) did not identify selenium as cause of, or contributor to, water column toxicity. Additional TIE work is being planned to be completed within the next year. TSM and SMW data (Sections 4.1 and 4.2) indicate tissue bioaccumulation well below OEHHA screening value. No screening value available to assess ecological effects of bioaccumulation.

5. Upper Newport Bay: Concentrations of chlorpyrifos in Upper Newport Bay were measured during one sampling event by the OCPFRD Section 319 monitoring (Section 4.6), and found to be at levels that may contribute to toxicity in the water column. The cause of toxicity in the water column of Upper Newport Bay needs further investigation. However, toxicity in the Upper Bay due to chlorpyrifos will be addressed by the TMDL for chlorpyrifos in San Diego Creek Reach 1.

6. Upper Newport Bay: Copper exceeds the CTR objectives (OCPFRD, NPDES Data, Section 4.5) and may be correlated with sediment toxicity and degraded benthic organisms (BPTCP Data, Section 4.4)

7. Upper Newport Bay: There is no evidence that concentrations of selenium are impairing beneficial uses or exceeding water quality objectives in the Upper Bay. There are no screening values available to assess ecological effects of bioaccumulation. TSM data (Section 4.2) indicate tissue bioaccumulation well below OEHHA screening value. The selenium TMDL for San Diego Creek Reach 1 will address the likely major contributor of selenium to the Upper Bay.

8. Upper Newport Bay: PCBs, DDT, chlordane, dieldrin, and toxaphene may contribute to sediment toxicity and degraded benthic organisms. (Section 4.4) Additional TIE work to be completed within the next year. TMDLs for PCBs and DDT in Lower Bay will consider sources of Upper Bay.

9. Upper Newport Bay PCH Bridge: Arsenic exceeded tissue bioaccumulation screening values. (See Section 4.1)

10. Upper Newport Bay: Arsenic found above OEHHA screening values in fish filets (TSM Data Section 4.2), but not detected in one of two most recent (1995) TSM samples.

11. Lower Newport Bay Rhine Channel: Rhine Channel designated a “toxic hot spot.” BPTCP data (Section 4.4) suggest correlation of listed metals and PCBs with sediment toxicity, and correlation of copper, chromium, and DDT with degraded benthic organisms. Additional sediment TIE work is being conducted to determine the cause of sediment toxicity. Bioaccumulation of listed constituents above screening values shown by SMW (Section 4.1).

12. Lower Newport Bay: PCBs and DDT may contribute to sediment toxicity and degraded benthic organisms (BPTCP Data Section 4.4). Additional sediment TIE work is being conducted to determine the cause of sediment toxicity. Bioaccumulation data (SMW Section 4.1) show generally declining trends for the legacy pesticides and PCBs, although PCBs in a composite fish filet sample collected in 1999 exceeded the OEHHA screening value. (Section 4.3) Additional fish filet monitoring is to be completed within the next year.

13. Lower Newport Bay: There is no evidence that concentrations of selenium are impairing beneficial uses or exceeding water quality objectives in the Lower Bay. There are no screening values available to assess ecological effects of bioaccumulation. SMW data (Section 4.1)

indicate tissue bioaccumulation well below OEHHA screening value. The selenium TMDL for San Diego Creek Reach 1 will address the likely major contributor of selenium to the Upper Bay.

14. Lower Newport Bay: See Number 6 above.

15. San Diego Creek, Upper Newport Bay, and Lower Newport Bay: Insufficient data and/or screening values to evaluate the significance of these constituents. Additional Investigation necessary.

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